WestConnex

Australian Government
BUILDING OUR FUTURE

NSW GOVERNMENT

M4-M5 Link

Submissions and Preferred Infrastructure Report

January 2018

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Part C

Response to community submissions

WestConnex

C Response to community submissions

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C1 Project governance

This chapter addresses issues raised in community submissions associated with the governance of the M4-M5 Link project.

Contents

C1.1 Role of Sydney Motorway Corporation

136 submitters have raised issues regarding the role of Sydney Motorway Corporation (SMC) in relation to delivering the project.

C1.1.1 Opposition to the management of the project

Submitters raised concerns regarding the management of the project, the involvement of SMC and their role as a private company. Submitters raised the following issues:

- The management of the project is corrupt, having a greater commercial benefit than public benefit
- Querying the transparency of SMC and seeking a greater level of transparency regarding the project
- The project should remain the responsibility of the government
- Concern that the final design and cost will be decided by SMC and not the government
- Concern about the power of companies to dictate the process
- SMC is a private organisation and therefore not subject to the *Government Information (Public Access) Act 2009* (NSW)
- There is no evidence that SMC or potential contractors have the capability to build the concept design presented in the Environmental Impact Statement (EIS)
- The project is flawed as a result of mismanagement and corruption from the outset
- The limited responsibility of SMC
- The details of spending have been hidden from public scrutiny by using the corporate structure of SMC
- The project has failed to comply with basic standards of probity and governance
- The companies and individuals responsible for the project have a financial conflict of interest
- Concern about how the NSW Government is being held accountable for the project and questions the absence of a government assessment and review
- The involvement of SMC is a deliberate strategy of the NSW Government to ensure there is no way for the community to raise complaints during construction (particularly regarding traffic impacts)
- Concern that the governance arrangement does not separate board-level responsibilities for commissioning from responsibilities for delivering the project and fails to provide mechanisms to manage the conflict between these roles
- Objection to the failure of SMC to abide by the Major Projects Assurance Framework [Infrastructure Investor Assurance Framework] in the governance of the project and requests that gateway reviews should be undertaken and made publicly available before further approvals are issued.

Response

A described in Chapter 1 (Introduction) of the EIS, NSW Roads and Maritime Services (Roads and Maritime) is the proponent for the project and has commissioned SMC to deliver WestConnex on behalf of the NSW Government. The NSW Government established SMC to finance, deliver and operate WestConnex, ensuring a well-resourced and highly experienced team focused specifically on project delivery. SMC is a private company limited by shares and established by the NSW Government in August 2014 under the *Corporations Act 2001* (Commonwealth), meaning that it is a private company that is not guaranteed by the State.

From April 2017, the shareholders of SMC include the NSW Minister for WestConnex the Hon. Stuart Ayres MP, the NSW Treasurer the Hon. Dominic Perrottet MP and NSW Minister for Finance, Services and Property the Hon. Victor Dominello MP. As a private company, SMC has a Board of Directors which has a duty to act in the best interest of its shareholders.

There are external governance and oversight arrangements in place for the project given the importance and scale of WestConnex and its cross-portfolio implications. This allows transparency and is facilitated through the WestConnex Interdepartmental Steering Committee (which includes Australian and NSW Government representation), regular project monitoring by Infrastructure NSW and quarterly project reporting to the NSW Cabinet Committee on Infrastructure. Further information on these arrangements is discussed in the *WestConnex Updated Strategic Business Case* (SMC 2015a) which is available on the WestConnex website[1].

The WestConnex program of works follows NSW Government reporting processes for significant capital projects, allowing further transparency regarding the project. These processes are prescribed by the NSW Cabinet Committee on Infrastructure and ensure the Committee has visibility of the progress of projects being undertaken by the NSW Government.

Reporting is undertaken by Infrastructure NSW monthly on the progress of project implementation and delivery. This is done as part of its role under the Infrastructure Investor Assurance Framework. These reports are prepared by Infrastructure NSW and provide independent advice on WestConnex to the NSW Cabinet Committee on Infrastructure. This ensures the NSW Government receives independent advice on the status of the project.

The *WestConnex Updated Strategic Business Case* (SMC 2015a) has been through an externally-managed Business Case Gateway Review, in accordance with the recommendation by the NSW Auditor-General that major projects be subject to the Infrastructure Investor Assurance Framework designed by Infrastructure NSW.

The involvement of SMC does not inhibit the community in making their concerns known during the delivery of the project, including during construction. A 24-hour, toll free project information and complaints telephone line will be implemented as part of the construction complaints management system, for which reports will be prepared as part of the construction compliance reporting and as requested by the Secretary the of NSW Department of Planning and Environment (DP&E) or the independent Complaints Commissioner. More information on consultation to be undertaken with with communities during construction is provided in **section A2.5**.

Chapter 3 (Strategic context and project need) and Chapter 30 (Project justification and conclusion) of the EIS demonstrates that the project would have a number of beneficial outcomes, in addition to the economic benefits, and is in the public interest. Further responses regarding the cost benefit analysis for the project, potential benefits and objectives of the project, are provided in **Chapter C3** (Strategic context and project need).

The assessment and approval process for the M4-M5 Link is being carried out in accordance with the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act), which sets a framework for assessment and determination of projects in NSW. The NSW Minister for Planning is required to determine whether or not to grant approval for the project under Part 5.1 of the EP&A Act following public exhibition of the EIS and consideration of submissions received. Planning approval for the project is required before construction can commence.

Roads and Maritime is the roads authority under the *Roads Act 1993* (NSW) and the proponent for the project under the EP&A Act. As the proponent, should the project be approved, Roads and Maritime would be responsible for meeting the conditions of approval. The sale of SMC would not affect Roads and Maritime's responsibility to comply with the conditions of approval, which would be reinforced via contractual arrangements between Roads and Maritime and the design and construct contractor(s). Further information on the sale of SMC is provided in **section C1.5**.

The Secretary's Environmental Assessment Requirements (SEARs) for the project required that the EIS provide a detailed description of the project and its construction in order that the impacts could be comprehensively addressed. The concept design described in Chapter 5 (Project description) of the EIS and the indicative construction methodology described in Chapter 6 (Construction work) of the EIS were prepared by a specialist technical advisory team using a rigourous design development process. The design, including tunnels and operational facilities, considered the best available technical information and adopted accepted industry practice environmental standards, goals and measures to minimise environmental risks.

[1] https://www.westconnex.com.au/resources

The EIS will inform detailed investigations, planning and surveys that will be undertaken by appointed design and construction contractor(s). The design developed by the design and construction contractor(s) will need to satisfy technical road design requirements based on the project as described in the EIS and Submissions and preferred infrastructure report, and be consistent with the environmental management measures and conditions of approval for the project.

Feedback provided by government agencies, local government and the community was considered throughout the development of the project and during the preparation of the EIS. A range of commitments and design changes were made in relation to the project in response to early feedback (refer to Chapter 7 (Consultation) of the EIS). Procurement of the design and construction contractor(s) will be undertaken in accordance with the relevant Roads and Maritime guidelines and other NSW Government procurement policies. The ongoing responsibility and financing of the project is discussed in **sections C1.2** and **C1.4** respectively.

Relevant project information as requested has been publicly disclosed by Roads and Maritime in accordance with the *Government Information (Public Access) Act 2009* (NSW).

C1.2 WestConnex operator

91 submitters have raised issues regarding the operator of WestConnex.

C1.2.1 Responsible entity for operation of WestConnex and M4-M5 Link

Submitters raised concerns regarding which entity will be responsible for the operation of WestConnex and the M4-M5 Link.

Response

The operation of the project and implementation of management measures would be the responsibility of Roads and Maritime, as the proponent of the project. While another entity might be contracted to operate the M4-M5 Link, Roads and Maritime would remain the roads authority and the proponent for the project as discussed in **section C1.1.1**.

C1.2.2 Accountability of WestConnex operator

Submitters raised concerns regarding the accountability of a private WestConnex operator. Specific queries, concerns and comments included:

- The entity responsible for operating the project will hold all the control, and that local councils would be ignored
- The project will be operated by private companies and subcontractors whose responsibilities may be unclear
- Who would be held accountable if the project makes local congestion and air quality worse
- Concern that the operator would be made liable for the actions undertaken by SMC, including the payout of claims in the event of mesothelioma triggered by the project.

Response

Once the M4-M5 Link is constructed, a single entity would undertake operations for the widened M4 Motorway, M4 East, New M5, M5 East, and M4-M5 Link from a combined motorway control centre at the St Peters interchange. The operating entity will use an integrated operations management control system to manage the entire WestConnex network.

The benefits of an integrated operations and maintenance strategy for WestConnex includes:

- Improved safety performance
- Improved network capacity/efficiency
- Improved concession value.

A number of operational activities would be integrated between the concessionaires for each component project when fully operational (the ‘integrated activities’). Examples of integrated activities include traffic incident management, emergency management and threat management. The operator will have relevant operational systems in place to facilitate the integrated activities.

Throughout the operational life of the WestConnex motorway, the operator remains accountable to Roads and Maritime, irrespective of it being a private company. Roads and Maritime is the roads authority under the *Roads Act 1993* (NSW) and the proponent under the EP&A Act. There would be a contractual arrangement between Roads and Maritime and the road operator, which would apply certain obligations. The operator would also be bound by the conditions of approval for the project and commitments made in the EIS and Submissions and preferred report. During operations, the proponent and the operator will engage in ongoing consultation with local councils, in accordance with the relevant legislation and conditions of approval.

Air quality impacts during the operation of the project were assessed in Appendix I (Technical working paper: Air quality) of the EIS and found that the project is expected to result in a decrease in total pollutant levels in the community due to a redistribution of vehicle emissions. Design of the infrastructure and additional environmental management measures have been identified to mitigate impacts from the operation of the project such that air quality impacts are minimised.

Ambient air quality monitoring will be carried out in the vicinity of the ventilation outlets installed as part of the project (see AQ29 in **Chapter E1** (Environmental management measures)). Monitoring will occur at key representative locations, identified in consultation with an independent air quality specialist and an Air Quality Community Consultative Committee (AQCCC), to allow direct comparison of measured ambient air quality with dispersion model predictions. The monitoring will commence at least 12 months prior to, and continue for at least two years, following the commencement of operation of the project. Monitoring results and a comparison of monitoring results against dispersion model predictions and relevant ambient air quality criteria will be made publicly available.

An assessment of the potential traffic and transport impacts from the project on roads around the Rozelle interchange, including Anzac Bridge, is provided in section 10.4 (for the 'With project' scenario) of Appendix H (Technical working paper: Traffic and transport) of the EIS. Management and mitigation measures specific to traffic and transport impacts on the Anzac Bridge are included in section 11.2.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS.

The benefits provided by the project as part of the WestConnex program of works include:

- Easing congestion on surface roads by providing an underground motorway alternative and allowing for increased use of surface roads by pedestrians and cyclists and for public transport
- Reducing through traffic on sections of major arterial roads including City West Link, Parramatta Road, Victoria Road, King Street, King Georges Road and Sydenham Road, facilitating urban renewal opportunities to be realised along parts of the Parramatta Road and Victoria Road corridors
- Improving network productivity on the metropolitan network, with more trips forecast to be made or longer distances travelled on the network in a shorter time. The forecast increase in vehicle kilometres travelled and reduction in vehicle hours travelled is mainly due to traffic using the new motorway, with reductions in daily vehicle kilometres travelled and reduction in vehicle hours travelled also forecast on some non-motorway roads
- Reducing travel times on key corridors, such as between the M4 Motorway corridor and the Sydney Airport/Port Botany precinct and between the main centres on the Global Economic Corridor, including Sydney central business district (CBD), Sydney Olympic Park and Parramatta CBD
- Facilitating future growth in Sydney's transport network by allowing for connections to the proposed future Western Harbour Tunnel and Beaches Link and Sydney Gateway projects.

The EIS does not claim that the project, as part of the WestConnex program of works, would address all of Sydney's congestion problems or resolve all bottlenecks in the project footprint and immediate surrounds. What the WestConnex motorway would do is provide a viable alternative route thereby improving traffic conditions on the surface road network over the short to medium term. Ongoing network improvement strategies and other key motorway connections would be required to address the ongoing pressures of Sydney's growing population over the longer term.

C1.2.3 Opposition to private organisations involvement in the project

Submitters raised concerns regarding the sale of the motorway and the right to accept tolls. Specific queries, concerns and comments include:

- Opposition to the involvement of Transurban and Leightons in the toll collection
- Opposition to operator's profits, which would benefit shareholders
- Opposition to the government's preference for toll roads as a solution which will be owned and operated privately
- Opposition to toll rights being privatised
- Tolls collected should be directed to State revenue
- Opposition to private organisations having the opportunity to design, build, operate and maintain the toll road
- Opposition to the project as it represents a transfer of public wealth to the private sector that will not provide beneficial outcomes to the public
- Request for the project to be publicly owned, to better protect the public
- Private operators may charge whatever tolls will produce the maximum return.

Response

No decision has been made by the NSW Government as to who will operate the WestConnex motorway once complete. This will be subject to the SMC sale process, as described in **section C1.5.1**.

A tolled motorway applies a 'user-pays' principle to the provision of the faster alternative route compared to existing routes. This principle aims to fund the improved infrastructure through contributions from those who would benefit the most, rather than paying for the project out of general government revenue which is raised from tax payers across NSW, not just those in Sydney that would benefit. This model is considered fair by Transport for NSW as the NSW Government alone cannot fund all infrastructure investment required in NSW. This model also accords with the Australian Government's *National Public Private Partnership Guidelines* (2015), which sets out the basic case for user charging, noting that this allows infrastructure investment to be brought forward. This in turn provides for improved economic growth and efficiencies, providing benefits across the State in both the short and long term. This road tolling model has been used to fund delivery of a number of motorway projects in NSW and across Australia.

In October 2014, the NSW Government agreed to a broad set of principles for tolling of Sydney's motorways. As per the NSW Government's tolling principles, tolls can continue while they provide broader network benefits or fund ongoing costs. In addition, new tolls are applied only where the users receive a direct benefit. Tolling fees for the project have been determined based on the NSW Government's principles for tolling and are comparable with other motorway tolling regimes in Sydney.

Significant ongoing investment is required to maintain and grow the NSW transport system. Generally, both private and public investment as well as toll revenue is used to fund motorway projects. Investment from the private sector is important for the provision of transport infrastructure and is a key element in the NSW Government's long-term plans for improving and expanding the motorway network.

Public Private Partnerships (PPPs) have been used successfully in Australia as a means of procuring infrastructure for motorways as well as a range of infrastructure in other sectors, including public transport. Allowing tolls to be collected by private partners through PPPs allows motorway corridors to be built faster as the investment is initially absorbed by the private sector which then recoups its investment through tolls over time. This directly benefits the public by delivering new infrastructure and benefits taxpayers who receive improved infrastructure for a relatively small initial cost outlay. It also enables the NSW Government to direct budget funding to other priorities such as education and health. Use of toll revenue from the project is discussed in **section C3.5.4**.

C1.3 Procurement

Two submitters raised issues regarding procurement of design and construction contractors and tolling contractors.

C1.3.1 Procurement process for the design and construction contractor(s)

Submitters raised concerns regarding the procurement process for the design and construction contractor(s), including the timing of contractor selection. Submitters were also concerned about the lack of financial transparency regarding the project works packages and tendering processes.

A submitter suggested that various construction companies, banks and consulting firms have already been awarded lucrative contracts.

Response

As discussed in section 1.1 of the EIS, the delivery mechanism adopted for the M4 East and New M5 projects is different to the approach for the M4-M5 Link. For the M4 East and New M5 projects, a design and construction contractor was appointed early (prior to the EIS being publicly exhibited) and therefore had direct input into the design development, EIS preparation and construction planning for those projects. Community and agency feedback during the M4 East and New M5 EIS exhibition periods indicated a preference for the 'usual' approach taken for projects of allowing the community to provide input into the scope of the project through the EIS public exhibition process before the detailed design of the project was undertaken and 'locked in'. After considering the community feedback on the issue, the approach of assessing a concept design has been adopted for the M4-M5 Link project. This approach presents the community and stakeholders with an opportunity to consider and provide feedback on the project before the detailed design work for construction of the project is carried out. Recent State significant infrastructure development in NSW that has been assessed on a concept design includes the M4 Widening, CBD and South East Light Rail and Sydney Metro City and Southwest projects.

A qualified and experienced design and construction contractor(s) would be appointed to undertake the detailed design and construction following determination of the EIS, should the project be approved. The design presented by the contractor(s) will need to satisfy all technical road design requirements and road functionality as described in the EIS and Submissions and preferred infrastructure report, and to be consistent with the approved scope of the project, including environmental management measures and conditions of approval for the project. Many of the environmental management measures require consultation with key stakeholders, including local councils. Issues raised during public consultation on the EIS or in the assessment of the project by DP&E will also be taken into account during the detailed design process.

Should changes to the project, such as improvements to the design or construction be made following approval of the project, then the proposed change(s) will be reviewed against the EIS, this Submissions and preferred infrastructure report and the conditions of approval. Where a modification is required, Roads and Maritime can apply to the NSW Minister for Planning. Any modification requests would be lodged with DP&E for assessment. The modification request would be appropriately notified and/or exhibited in accordance with the EP&A Act and Environmental Planning and Assessment Regulation 2000.

Procurement of design and construction contractor(s) will be undertaken in accordance with relevant NSW legislation, SMC and Roads and Maritime guidelines and other NSW Government procurement policies.

It is anticipated the project would be constructed and opened to traffic in two stages (refer to section 1.3.1 and section 4.3.2 of the EIS). Requests for Expressions of Interest (EOI) from the market for the design and construction of the mainline tunnels (Stage 1) were issued at the end of 2016. Invitations to tender were released in June 2017 and tenders are currently being evaluated. Should the project be approved, it is expected that the mainline tunnel contractor would be appointed in 2018.

Requests for Pre-registration of Interest for the design and construction of the Rozelle interchange and Iron Cove Link (Stage 2) were released in January 2018. Requests for EOI are expected to be issued in March 2018.

C1.4 Funding

28 submitters have raised issues regarding the funding arrangements for the M4-M5 Link and of the full WestConnex program of works.

C1.4.1 Funding arrangements of the project and the WestConnex program of works

Submitters raised concerns and questions regarding how the project would be funded. Particular funding concerns included:

- Dissatisfaction with funding of the project by the State sale of assets
- The Australian Government does not have a competent funding plan and is not willing to fund the project
- The project should be funded by the State borrowing the money and retaining ownership of the infrastructure to collect the toll income, which would pay off the cost in 10 years
- Dissatisfaction that public funds are being diverted from public transport infrastructure
- Query about how the project will be funded
- Concern that future toll revenue will not cover the financial cost of the project
- General opposition to the funding arrangement of the project
- Concern regarding the transparency of the funding arrangements
- An independent review of the project should be undertaken due to the overall cost of the project
- An Independent Commission Against Corruption (ICAC) inquiry should be completed to investigate why money is being spent without a cost benefit analysis of a freight rail alternative to the project
- The taxpayer would be burdened with future costs while private operators make money
- Concern that the project is being funded through the sale of shares in SMC
- Concern that the NSW Government supports the proposal based on the assumption that the owners of the toll road would 'donate' funds to political parties
- Objection to the Australian Government funding $3 billion of WestConnex
- Concern that tolls on existing roads (M4 Widening and M5 East) were introduced to fund the project
- Concern about the privatisation of public assets including the ports and electricity, was done to fund the project
- The former NSW Premier has claimed that the project (and others) would be funded by the partial sale of Transgrid and Ausgrid and an uplift in stamp duty.

Response

WestConnex is being delivered by a financing model which includes an initial contribution from the State and Australian Governments, with private sector debt and tolling revenue providing the remaining funding for the project. This financing strategy has allowed the NSW Government to recycle its equity investment in SMC by effectively using the sale proceeds from the initial stages to help fund the final stage.

The NSW Government is contributing over $2 billion to fund the WestConnex program of works, while the Australian Government is providing contributions to the NSW Government of over $3.5 billion. The project would deliver more than $20 billion in economic benefits, including employment and expenditure during construction and flow-on effects in the medium-long to long term, and broader economic benefits due to improved connectivity between areas with high employment densities.

Supplementary funding of WestConnex, as proposed in the *WestConnex Updated Strategic Business Case* (SMC 2015a), assumes a distance based toll would be implemented on operation of each component project. Distance based tolling means that motorists would only pay tolls for the sections of the motorway they use. Tolls for the entire WestConnex motorway would be capped at a maximum amount of $8.60 ($2017) for cars and light commercial vehicles and a distance of around 40 kilometres. Cars and light commercial vehicles would pay one third of the toll for heavy commercial vehicles. Tolls would escalate up to a maximum of four per cent or the consumer price index (CPI) per year (whichever is greater) until 2040. After that, CPI would apply. Use of toll revenue from the project is discussed in **section C3.5.4**.

In August 2017, the NSW Government announced it would proceed with the sale of at least a 51 per cent stake in SMC (NSW Government 2017) while retaining a 49 per cent interest. The sale of SMC will be used to help fund the M4-M5 Link (see further details in **section C1.5.1**). This sale forms part of the NSW Government's core strategy to build budget strength while delivering an infrastructure pipeline that creates jobs and drives economic growth. The use of toll revenue from existing toll roads depends on the ownership structure of the asset. The NSW Government determines the most appropriate use of these funds.

In 2011, the NSW Government established the Restart NSW fund to enable high priority infrastructure projects to be funded and delivered. As at June 2017, funds deposited into Restart NSW, since 2011, have totalled $29.8 billion. Restart NSW is the vehicle for the delivery of the Rebuilding NSW plan, which is the NSW Government's 10-year plan to invest $20 billion in new infrastructure funded by the electricity network transactions, Commonwealth Government Asset Recycling Initiative payments, and investment earnings. These proceeds are first deposited into Restart NSW before being invested into infrastructure projects, such as the M4-M5 Link. The NSW Government is also investing $41.5 billion (2016–2017 NSW Budget) in transport projects over the next four years (including roads and public transport).

Strategic alternatives to the project, including investment in rail, are described in **section C4.2.1** and **section C4.4.1**.

The establishment of an inquiry is beyond the scope of the EIS for the project and is a matter for the NSW Government.

C1.5 Sale of Sydney Motorway Corporation

762 submitters have raised issues regarding the sale of SMC.

C1.5.1 Opposition to or concern regarding the sale of SMC

Submitters raised concerns or objections to the sale of SMC. Submitters were specifically concerned that the community would not be adequately represented or be able to hold the company accountable once SMC was sold to a private company. Specific concerns included:

- Taxpayers and road users would pay more in the long run due to the costs of private company management, bonuses and shareholders
- Concern regarding private companies having the responsibility for oversight, design, cost and implementation of the M4-M5 Link and the NSW Government will have less control
- Concern over the sale of SMC prior to the final design and construction plans for the project being determined
- Guarantee of the protection of public interests in the event of the sale of SMC
- Concern over who will be holding the contractors accountable in the event of the sale of SMC
- Concern over transparency of the project in the event of the sale of SMC, including transparency of the costs and impacts
- Concern about the weakening of the SMC position reducing its value
- Concern that the project further privatises Sydney's road network
- The NSW Government's intent is to hasten the approval process to ensure successful and smooth sale of SMC concurrently with the assessment of the EIS to shore up its budget ahead of the 2019 state election

- The EIS was rushed in order to meet the NSW Government's timeframe for the sale of 51 per cent of SMC
- Objection to spending funds to build an asset only to sell it to a private company
- The fast-tracking of the sale of SMC as the NSW Auditor-General runs a second audit into the project
- All financial risk associated with the project is being borne by the taxpayer until SMC is sold
- Concern that selling SMC shares to fund the project will lead to the private funder seeking to have an input in the final design and construction of the tollway
- Concern about a no competition clause associated with the privatisation of SMC
- Concern regarding the ability of a privately owned SMC to make decisions without community input
- Lack of detail in the M4-M5 Link EIS (use of a concept design compared to a detailed design) is an attempt to get approval for the project so that SMC shares can be sold. The submitter would like the project approval to be postponed until the sale of SMC has been finalised so that there is certainty around the future delivery and funding mechanisms of the organisation driving the project
- Calls for a full inquiry into the proposed sale [of SMC].

Response

A tolled motorway applies a 'user-pays' principle to the provision of the faster alternative route compared to existing routes. This principle aims to fund the improved infrastructure through contributions from those who would benefit the most, rather than paying for the project out of general government revenue which is raised from tax payers across NSW, not just those in Sydney that would benefit. This model is considered fair by Transport for NSW as the NSW Government alone cannot fund all infrastructure investment required in NSW. This model also accords with the Australian Government's *National Public Private Partnership Guidelines* (2015), which sets out the basic case for user charging, noting that this allows infrastructure investment to be brought forward. This in turn provides for improved economic growth and efficiencies, providing benefits across the State in both the short and long term. This road tolling model has been used to fund delivery of a number of motorway projects in NSW and across Australia.

In August 2017, the NSW Government announced it would proceed with the sale of at least a 51 per cent stake in SMC (NSW Government 2017). The NSW Government would retain up to a 49 per cent stake in SMC. The sale of SMC will be used to help fund this final stage of the WestConnex program of works. The NSW Treasurer announced that the NSW Government's strategy of the sale of SMC was informed by extensive market sounding and analysis by NSW Treasury and that it would ensure a competitive tender process that would deliver the best value for the people of NSW. The NSW Government called for parties to register their interest in the sale of SMC in late 2017. Following a tender process, contractual obligations and commitments would be agreed with the future owner.

The sale of SMC prior to the finalisation of the design would not impact community involvement during the detailed design and delivery of the project by the design and construction contractor(s). The detailed design of the project is required to be consistent with the approved scope of the project described in Chapter 5 (Project description) of the EIS. Regardless of the outcome of the sale process, Roads and Maritime is the roads authority under the *Roads Act 1993* (NSW) and the proponent for the project under the EP&A Act. As the proponent, should the project be approved, Roads and Maritime would be responsible for meeting the conditions of approval. The sale of SMC would not affect Roads and Maritime's responsibility to comply with relevant conditions of approval, which would be reinforced via contractual arrangements between Roads and Maritime and the design and construct contractor.

The EIS has been prepared over an appropriate timeframe (around two years for the formal EIS preparation, not including preliminary assessment) and through a considered and robust process, in accordance with the program for WestConnex established in the *WestConnex Strategic Business Case*:

- A State Significant Infrastructure Application Report (SSIAR) was lodged with DP&E in January 2016 with subsequent SSIA addendums lodged in September 2016 and March 2017
- SEARs were issued by DP&E in March 2016 with subsequent revisions of the SEARs based on the SSIAR addendums outlined above issued in November 2016 and May 2017 respectively
- The EIS was released for public exhibition for 60 days between 18 August and 16 October 2017
- The Submissions and preferred infrastructure report (this report), responding to all submissions received on the EIS during the public exhibition period, was prepared and lodged with the DP&E.

The Audit Office of NSW has announced its intention to audit the WestConnex program of works for a second time. The NSW Auditor-General determines the schedule of these audits. The scope and timing for the next audit of WestConnex is yet to be confirmed.

As outlined in **section A2.5**, SMC and Roads and Maritime will continue to provide consultation opportunities for the community and other stakeholders during the ongoing refinement of the design and during construction. Consultation will be carried out with a view of further minimising impacts of the project on communities. The community and other key stakeholders will also be involved in consultation on the Social Infrastructure Plan and Urban Design and Landscape Plans (UDLPs) for the project. Relevant councils will also be consulted with during the development of the Construction Environmental Management Plan and various sub-plans.

During construction, a dedicated community relations team will deliver:

- A detailed Community Communication Strategy (identifying relevant stakeholders, procedures for distributing information and receiving/responding to feedback, and procedures for resolving stakeholder and community complaints during construction and operation)
- Notification letters and phone calls to residents and businesses directly affected by construction works, changes to traffic arrangements and out-of-hours works
- Face-to-face meetings with landowners as needed
- Regular community updates on the progress of the construction program
- Regular updates to the WestConnex website
- Media releases and project advertising in local and metropolitan English language and non-English language newspapers to provide contact information for the project team
- Site signage around construction ancillary facilities
- 24-hour, toll-free project information and complaints line, a dedicated email address and postal address.

In addition, a number of the environmental management measures identified in the EIS would require further consultation with the community and project stakeholders. These are summarised in **Chapter E1** (Environmental management measures).

See **Chapter C7** (Consultation) for responses to issues about consultation for the M4-M5 Link project.

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C2 Assessment process

This chapter addresses issues raised in community submissions associated with the assessment process for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 2 (Assessment process) of the EIS for further detail on the assessment process.

Contents

C2.1 Adequacy and independence of the EIS

2,522 submitters have raised issues regarding the adequacy and independence of the EIS.

C2.1.1 Adequacy of the M4-M5 Link EIS

Submitters raised concerns regarding the adequacy and integrity of the EIS in providing a detailed, consistent, justified, comprehensive and clear assessment of the environmental, social and economic impacts of the project. Submitters considered that the EIS did not adequately assess the project risks, and therefore did not provide a gauge on the real impact to local residents or give the community a meaningful opportunity to comment on impacts or mitigation measures. Additionally, submitters were concerned about the reliability of the EIS. Submitters made the following criticisms of the EIS:

- The EIS does not achieve its stated aims and does not meet a number of the Secretary's Environmental Assessment Requirements (SEARs), particularly in relation to meaningful consultation
- Design initiatives shared at public consultation sessions were not included in the EIS
- Concern that schools are not shown on the EIS plans and therefore impacts on schools were not adequately considered
- The modelling, monitoring and engineering criteria for the EIS is inconsistent as it was issued by Sydney Motorway Corporation (SMC) instead of the proponent (NSW Roads and Maritime Services (Roads and Maritime))
- The EIS relies on previous investigations completed for Stages 1 and 2 of WestConnex which are now out-of-date as the Haberfield, Ashfield and St Peters interchange built environments have changed with construction of the M4 East and New M5 projects
- Concern that the issues and inadequacies in the project's updated business case and traffic predictions have been carried through in the EIS
- The EIS understates impacts and provides generic mitigation measures, stating that all the negative impacts would be manageable or acceptable, and would be clarified in the detailed design phase
- The EIS is biased, quoting studies commissioned by toll road operators
- There is a lack of detail regarding the integration between the M4-M5 Link, other WestConnex projects and the wider road network, specifically regarding construction staging
- Impacts on residents to the north of Annandale, in Annandale and on The Crescent were not adequately addressed
- Sensitive receivers at Rozelle north of Victoria Road in apartment complexes such as Balmain Shores were not adequately identified in the EIS
- The assessment of public transport initiatives in the inner west is based on outdated information which is misleading and does not reflect the needs of the community
- The EIS does not meet the SEARs requirements for project development and construction
- The EIS does not portray accurately the development of the project
- The professionals responsible for planning the project do not have on-ground familiarity with specific project sites, and therefore could not adequately address impacts and safety concerns
- The EIS misleads public opinions by presenting large green spaces without discussing the reality of increased noise and air pollution
- The EIS uses a traffic model developed by Roads and Maritime who are pushing a motorway agenda.

Response

The EIS was prepared in accordance with Part 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act), the SEARs and Part 3 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (NSW). A checklist against this regulation is provided in Appendix D of the EIS. A copy of the SEARs, including an indication of where they are addressed in the EIS is provided in Appendix B (Secretary's Environmental Assessment Requirements checklist) of the EIS.

Roads and Maritime has commissioned SMC to deliver WestConnex, on behalf of the NSW Government. However, Roads and Maritime is the proponent for the project. The EIS was prepared by a team of qualified professionals to provide a balanced, merit-based environmental impact assessment, and was reviewed by Roads and Maritime. The EIS was not commissioned by road toll operators.

Further, subject matter experts from Roads and Maritime were involved with reviewing the approach and methodology for quantitative modelling undertaken for the EIS and for reviewing the outcomes of the various technical assessments for the EIS. SMC is responsible for preparing the planning approval applications and associated documents in respect to the project (including the EIS) on behalf of Roads and Maritime under Part 5.1 of the EP&A Act. All third-party sources of information used in the EIS are referenced for transparency and the EIS does not make any claims as to the accuracy or reliability of the sourced information.

Consultation on the M4-M5 Link concept design sought to provide the community and other stakeholders with information about the M4-M5 Link project before the release of the EIS, as well as the opportunity to provide feedback. Consultation on the Concept design report provided the community and stakeholders with the opportunity to provide input into the design prior to the appointment of design and construction contractor(s) and the preparation of a detailed design. The specific chapters of the EIS address community concerns. However, section 7.2 of the EIS provides an overview of how community feedback has been addressed. Table 7-10 details the feedback received and where the issues have been addressed in the EIS. As outlined in section 7.6.2 of the EIS, consultation with the community and stakeholders will continue during the detailed design and construction planning stage of the project, should it be approved.

The development of the project is outlined in Chapter 4 (Project development and alternatives) of the EIS.

The EIS included a range of comprehensive technical studies prepared in accordance with the key issues identified in the SEARs, which included requirements issued by key government regulatory agencies as well as industry standards and guidelines. The EIS, including detailed technical studies, was reviewed by the NSW Department of Planning and Environment (DP&E) (and its independent technical peer reviewers) and key NSW Government agencies to confirm that it addressed the SEARs prior to being finalised and placed on public exhibition.

The EIS was prepared using a conservative approach, which objectively and thoroughly assessed the worst case impacts and scenarios across study areas directly or indirectly affected by construction and operation of the project, as relevant to the methodology of each assessment. For example, information on indicative temporary road network modifications during construction at The Crescent at Annandale was provided in Chapter 8 (Traffic and transport) of the EIS. Operational traffic modelling considered a comprehensive range of specific and cumulative scenarios, including scenarios to identify traffic predictions with and without the project.

The technical studies prepared for the EIS involved the collection of baseline data appropriate to characterise the existing environment at the time of the assessment of the M4-M5 Link project. The technical studies specific to the project were prepared with consideration of changes to the built and natural environment as a result of Stages 1 and 2 of WestConnex. The studies considered in detail the interfaces between the M4 East around Haberfield, and the New M5 around St Peters. This took into account potentially new and additional impacts at these locations, lessons learnt from the previous projects (see **section C2.1.8**) and cumulative impacts, to ensure impacts could be comprehensively avoided, managed and minimised.

Schools are identified in the EIS as sensitive receivers and potential impacts on them have been assessed in the relevant technical studies. In the air quality assessment, schools, together with child care centres and hospitals, are described as community receptors and are shown on Figure 9-4 of the EIS (with corresponding location details in Table 9-8 of the EIS). In the human health risk assessment (refer to Chapter 11 (Human health risk) of the EIS) schools are identified as community receptors, which are shown on Figure 11-2 of the EIS (with corresponding location details in Table 11-2 of the EIS). Although the summary of the noise and vibration assessment in Chapter 10 (Noise and vibration) of the EIS does not identify schools on a figure, the potential impacts and description of their locality is provided for each noise catchment area assessed. Figures (site plans) showing the location of educational facilities, together with a corresponding list of sensitive receivers, including schools, is provided in Annexure B of Appendix J (Technical working paper: Noise and vibration) of the EIS. A description of schools in proximity to the project footprint is also provided in section 12.2.2 and Chapter 14 (Social and economic) of the EIS and shown on Figures 14-4 to 14-9. An assessment of the potential construction and operational impacts of the project, including on schools, is presented in sections 14.3 and 14.4 of the EIS.

The *WestConnex Updated Strategic Business Case* (SMC 2015) used traffic modelling to forecast traffic flows and changes on the future road network in 2031. Linear interpolation was used to estimate the benefits up to 2031 and for benefits beyond 2031, a 'decay' function was used which assumes there would be plateauing over time due to increased traffic resulting from population growth. This was a conservative approach. Further details about the approach to the traffic and transport assessment for the EIS, including modelling assumptions, are provided in **Chapter C8** (Traffic and transport).

Potential impacts to the area in and around the north of Annandale including The Crescent are considered throughout the EIS, including but not limited to the following sections:

- Chapter 8 (Traffic and transport) of the EIS: The area is part of the study area for the traffic and transport assessment shown in Figure 8-2. Impacts to traffic in the area are described in section 8.3.1 for around Rozelle civil and tunnel site (C5) and The Crescent civil site (C6) during construction and in section 8.3.3 for the operational performance of the Rozelle interchange (including impacts to The Crescent, Johnston Street and City West Link)
- Chapter 9 (Air quality) of the EIS: The area is part of the study area for the air quality assessment shown in Figure 9-3. Air quality impacts to the area during construction are assessed in section 9.6.1 for around Rozelle civil and tunnel site (C5) and The Crescent civil site (C6) and in section 9.7 for operational impacts
- Chapter 10 (Noise and vibration) of the EIS: The area is part of noise catchment area Noise Catchment Area (NCA)21 as shown in Figure 10-2. Noise impacts in the area during construction are assessed in section 10.3.3 and noise impacts during operation are assessed throughout section 10.4.2 (including in Table 10-62 and 10-63)
- Chapter 14 (Social and economic) of the EIS: The area is part of the study area for the social and economic impact assessment shown in Figure 14-1 under the "Leichhardt-Annandale" Statistical Area Level 2 boundary. Social and economic impacts in the area during construction are considered throughout section 14.3 and impacts during construction are assessed throughout section 14.4.

Additional detail regarding the impacts to the area in and around the north of Annandale including The Crescent are also provided in the respective technical working papers prepared for the EIS.

Sensitive receivers in apartment complexes north of Victoria Road are considered throughout the EIS, including but not limited to the following:

- Nearby roads to the receivers are located within the study area for the traffic and transport assessment (refer to Figure 8-2 of the EIS)
- The receivers are considered within the study area for the air quality assessment (refer to Figure 9-3 of the EIS) and specifically as elevated receivers (refer to Figure 9-5 of the EIS)
- The receivers are considered as part of NCA 35 in the noise and vibration assessment (refer to Figure 10-6 of the EIS).

Concerns regarding the analysis of public transport strategic alternatives are addressed in **section C4.2**. The analysis of strategic alternatives involved consideration of the most up to date and relevant Australian Government and NSW Government policies and plans available at the time of writing, including the *NSW Long Term Transport Master Plan* (Transport for NSW 2012a) and the *State Infrastructure Strategy Update 2014* (State Infrastructure Strategy) (Infrastructure NSW 2014).

The WestConnex Road Traffic Model version 2.3 (WRTM v2.3) was used for strategic traffic modelling for the project. The WRTM v2.3 is a strategic model developed and operated by Roads and Maritime to provide a platform to understand changes in future weekday travel patterns under different land use, transport infrastructure and pricing scenarios. An integral part of the modelling process was the involvement of independent expert peer reviewers to examine model development, methodologies for the production of traffic models and the traffic forecasts. The independent peer reviews included an independent expert who is recognised in the field of toll road patronage forecasting and transport behavioural choice modelling.

The construction program for the M4-M5 Link would overlap with the M4 East project around Haberfield and Ashfield and the New M5 project around St Peters. Around Haberfield and Ashfield, the majority of the above ground infrastructure required for the M4-M5 Link project is currently being built by the M4 East project. The large civil construction works such as the construction of the Wattle Street interchange and the Parramatta Road ventilation facility (including the outlet for the M4-M5 Link project) will be complete or nearing completion before construction of the M4-M5 Link commences. This includes the construction of the M4-M5 Link entry and exit ramps along Wattle Street, including the dive and cut-and-cover structure.

Around St Peters, clean-up of the Alexandria Landfill site, construction of the St Peters interchange, and construction of the St Peters ventilation facility for the M4-M5 Link project is being carried out by the New M5 project. This includes construction of the M4-M5 Link entry and exit ramps, upgrades of the local roads (including Campbell Road) and the provision of a construction hardstand area and construction access driveway that will be reused for the Campbell Road civil and tunnel site (C10).

The M4-M5 Link project will need to carry out some civil construction works (including construction of the Campbell Road ventilation facility) and civil finishing works for infrastructure at Haberfield and St Peters. However, construction of surface infrastructure at both locations as part of the M4-M5 Link project has been minimised as much as practicable. Refer to section 5.4 of the EIS for more detail about the integration works with other WestConnex component projects.

Further detail regarding longer duration construction impacts at Haberfield/Ashfield and St Peters from the overlap of other WestConnex component projects with the M4-M5 Link is described in Chapter 26 (Cumulative impacts) of the EIS and **section C14.12.1**.

In some circumstances, baseline data from previous WestConnex component projects was used where it was determined that the data was appropriate to inform the assessment of the M4-M5 Link project. For example, the noise monitoring undertaken for the M4-M5 Link between July 2016 and November 2016 has been supplemented by background noise measurements undertaken previously during 2014 and 2015 for the M4 East and New M5 projects at Haberfield and St Peters. Background noise measurements from the M4 East and New M5 projects provide an accurate representation of the existing noise environment in the respective areas prior to the commencement of construction works (which will not be a permanent component of the noise environment in these areas). If new background noise measurements were taken at Haberfield/Ashfield and St Peters between July 2016 and November 2016 this would capture the noise from the M4 East and New M5 construction works and therefore construction noise impacts from the M4-M5 Link would not adequately be identified. Therefore, the exclusion of construction noise when establishing ambient noise levels (and subsequent noise management levels (NMLs)) results in more conservative (or lower) NMLs, meaning the project would be subject to more stringent requirements with respect to the noise criteria that need to be adhered to during construction.

The assessment was undertaken using an environmental risk analysis process utilising a likelihood and consequence approach (refer to Chapter 28 (Environmental risk analysis) of the EIS), the best available technical information and adopted good practice environmental standards, goals and measures to minimise environmental risks. The environmental risk analysis:

- Identified environmental issues, including key issues in the SEARs, and any other issues
- Examined potential impacts and proposed management and mitigation measures in relation to the identified issues

- Identified the impacts likely to remain after management and mitigation measures are applied (ie the residual impacts).

Mitigation measures for risks identified during the environmental risk analysis will be confirmed during detailed design and will employ a combination of best practice environmental management measures in accordance with industry standards, specific measures and the conditions of approval to minimise and manage the impacts. Refer to **Chapter E1** (Environmental management measures) for the environmental management measures proposed.

C2.1.2 Adequacy of assessment of a concept design

Submitters raised concern about the assessment of a concept design in the EIS, which suggests that there has not been proper oversight or sufficient analysis of impacts during both construction and operation. Submitters criticised the EIS document for being a strategy rather than a plan. They were concerned about the uncertainty surrounding the project design and risks, and the lack of a detailed description of the geographical location or engineering specifications of the project. Submitters suggested that the EIS should be rejected on the basis of being a concept design and should be replaced by a more definitive EIS for public comment. Specific issues that were raised included:

- The concept design assessed in the EIS is subject to change, meaning that the project is not aligned with the final design of the project and should not be approved, specifically the design of the Rozelle interchange tunnels, the Inner West subsurface interchange tunnels and the tunnel alignments. It was queried why surveys of the Sydney Water tunnels or geotechnical drilling and testing were not undertaken to provide definitive alignments of tunnels in the Newtown area
- The EIS is indicative only and therefore does not give the community a meaningful opportunity to comment on risks and impacts to surrounding communities, the environment, and existing businesses and roads, which would be identified during detailed design
- The EIS documents for Stages 1 and 2 of WestConnex were assessed following the appointment of and release of the final design by the successful contractor and the EIS for the Stage 3 M4-M5 Link should follow the same process
- There are significant financial and environmental risks in allowing private contractors to develop their designs without a definitive EIS.

Response

As described in section 6.1 of the EIS, the delivery mechanism adopted for the M4 East and New M5 projects is different to the approach for the M4-M5 Link. For the M4 East and New M5 projects, a design and construction contractor was appointed early (prior to the EIS being publicly exhibited) and therefore had direct input into the design development, EIS preparation and construction planning for those projects. Community and agency feedback during the M4 East and New M5 EIS exhibition period indicated a preference for the usual approach taken for projects of allowing the community to provide input into the scope of the project through the EIS public exhibition process before the detailed design of the project was undertaken and 'locked in'. After considering the community feedback on the issue, the approach of assessing a concept design has been adopted for the M4-M5 Link project. This approach presents the community and stakeholders with an opportunity to consider and provide feedback on the project before the detailed design work for construction of the project is carried out. Recent State significant infrastructure development in NSW that has been assessed on a concept design includes M4 Widening, CBD and South East Light Rail and Sydney Metro City and Southwest.

The SEARs required that the EIS provide a detailed description of the project and its construction in order that the impacts could be comprehensively addressed. The concept design for the project presented in the EIS was assessed using a conservative approach, which included identifying the project components, the project footprint (section 5.1.2 of the EIS) and assessing the worst case impacts and scenarios. The design of the project presented in the EIS, including tunnels and operational facilities, considered the best available technical information and adopted good practice environmental standards, goals and measures to minimise environmental risks. The construction methodology developed for the concept design has been based on input from constructability experts and technical specialists with appropriate expertise.

The development of the concept design for the project was informed by geotechnical investigations undertake between May 2016 and May 2017 to identify ground conditions along the alignment of the project tunnels, including around Newtown. Potential impacts to key Sydney Water utility services including the Pressure Tunnel and the City Tunnel are considered in section 12.3.4 of the EIS and the interface of the project with these tunnels is shown in Figure 12-31 of the EIS. The alignment of these tunnels has considered information provided by Sydney Water.

Due to the clearance achieved by the M4-M5 Link alignment relative to the Sydney Water tunnels, and the geological conditions in the areas where these cross over points occur, it is expected the Sydney Water assets would not be adversely impacted. Detailed surveys will be undertaken prior to tunnelling to verify the levels and condition of these Sydney Water assets. A detailed assessment will be carried out in consultation with Sydney Water to demonstrate that construction of the M4-M5 Link tunnels would have negligible adverse settlement or vibration impacts on these tunnels.

Further detailed investigations, planning and surveys will be undertaken by the design and construction contractor(s). All technical road design requirements and road functionality as described in the EIS and this Submissions and preferred infrastructure report will need to be considered and environmental management measures and conditions of approval for the project will need to be satisfied. Where the detailed design is inconsistent with the approved project, further assessment and approval would be required under the EP&A Act. If further assessment/approval is required due to project design changes, the applicable statutory process will be followed prior to commencement of construction or operation of the relevant aspect of the project. This may be in the form of a modification to the Instrument of Approval under section 115Z1 of the EP&A Act, depending on the scale of the proposed modification and the potential for environmental or social impacts. The design and construction contractor(s) would be appointed following the determination of the EIS and be selected based on various criteria, including their proven ability to deliver large and complex projects, and to provide value for money.

Aspects of the detailed design, including the Social Infrastructure Plan and Urban Design and Landscape Plans (UDLPs), will be developed in consultation with the community and relevant local councils. Further, Business Management Plans would be developed during detailed design to identify businesses that have the potential to be adversely affected by construction activities. Management measures will be implemented to maintain appropriate vehicular and pedestrian access to businesses and to maintain the visibility of the businesses. These measures will be determined in consultation with the owners of the identified businesses (see environmental management measure SE1 in **Chapter E1** (Environmental management measures)).

Issues regarding project costs and financial risks are addressed in **section C3.4**.

C2.1.3 Environmental assessment of the whole of the WestConnex program of works

Submitters raised concern that the M4-M5 Link EIS should have been completed as part of an assessment of the whole WestConnex program of works so that the full extent of impacts of WestConnex could be assessed accurately.

Further, submitters raised concerns about the cumulative impacts of the different WestConnex projects including that there was no holistic assessment of impacts, particularly at Haberfield/Ashfield and St Peters. Specifically, it was considered that the M4 East Parramatta Road ventilation facility and the New M5 St Peters ventilation facility should have been included in a table listing the motorway operations complexes and operational ancillary infrastructure in Chapter 5 of the EIS in order to demonstrate the holistic impact of the WestConnex program of works.

Response

An overview of the impacts from the WestConnex program of works has been presented in the 2013 Strategic Environmental Review, the *WestConnex Strategic Business Case Executive Summary* (Sydney Motorways Project Office, 2013) and the *WestConnex Updated Strategic Business Case* (Sydney Motorway Corporation, 2015), which are available on the WestConnex website[1].

Roads and Maritime always intended to deliver WestConnex in stages due to its size, complexity, cost and funding model. It was also recognised that the design for each stage would require refinement and that this was best achieved by a separate design and construct delivery mechanism.

[1] https://www.westconnex.com.au/resources

Specifically, the factors considered in the staging of the WestConnex component projects (as outlined in the *WestConnex Updated Strategic Business Case*) included:

- Transport benefits and traffic management
- Timing of pre-construction activities
- Government funding requirements
- Infrastructure market capacity.

Each of the tunnelling component projects of the WestConnex program of works (ie the M4 East and New M5 projects) has assessed the cumulative impacts of previous and future WestConnex projects, thereby providing an assessment of the overall program based on the most up to date information. In accordance with the SEARs, the M4-M5 Link EIS included a cumulative impact assessment of potential construction and operation environmental impacts (adverse and beneficial) of the project with the other WestConnex component projects (refer to Chapter 26 (Cumulative impacts) of the EIS). This included an assessment of cumulative traffic and transport, air quality, noise and vibration, human health, urban design and visual amenity, social and economic, non-Aboriginal heritage, biodiversity, soil and water quality, flooding and drainage, groundwater and Aboriginal heritage impacts.

As the M4-M5 Link is the final stage of the WestConnex program of works, cumulative impacts could be more realistically assessed using information presented in the EISs for the previous component projects. Longer term construction impacts that may result in construction fatigue at Haberfield/Ashfield and St Peters are discussed in section 26.3.1 of the EIS.

Chapter 5 (Project description) of the EIS provides details of the operational facilities, such as operational ancillary infrastructure and motorway operation complexes. The Parramatta Road ventilation facility is being constructed as part of the M4 East project, however, the ventilation outlet for the M4-M5 Link that is part of this facility would be fitted out and operated by the M4-M5 Link, should the project be approved. The Parramatta Road ventilation facility has been assessed as part of the M4 East project and in the cumulative scenarios in the M4-M5 Link EIS. The St Peters ventilation facility is being constructed as part of the New M5 project. The Campbell Road motorway operations complex would be constructed and operated as part of the M4-M5 Link.

Cumulative operational air quality impacts from the combined ventilation outlets for the WestConnex program of works are described in detail in Chapter 9 (Air quality) and Appendix I (Technical working paper: Air quality) of the EIS. Table 2-3 of Appendix I (Technical working paper: Air quality) of the EIS outlines the tunnel ventilation facilities included in the air quality assessment including for the following projects:

- M5 East (existing facility) at Turrella
- M4 East (under construction) at Parramatta Road and Underwood Road respectively
- New M5 (under construction) at St Peters interchange, Arncliffe and Kingsgrove respectively
- M4-M5 Link (proposed) at Parramatta Road, Rozelle interchange, Iron Cove Link and Campbell Road respectively
- F6 Extension (proposed) at Arncliffe and Rockdale.

The changes in the total emissions resulting from the project are shown in Table 26-5 of the EIS. These changes can be viewed as a proxy for the projects and the cumulative air quality scenario's impact on regional air quality which, on the basis of the results, are likely to be negligible (refer to section 9.8 of the EIS).

C2.1.4 EIS should assess other tolled projects

Submitters raised concern that the M4-M5 Link project refers to benefits from other road projects for which the full costs, benefits and impacts should be considered, and were concerned that there was not information regarding future extensions. A submitter believed the cumulative impacts of the Western Harbour Tunnel project should be assessed in conjunction with the M4-M5 Link project as the Rozelle interchange forms Stage 1 of the Western Harbour Tunnel project.

Response

The M4-M5 Link is the final stage of the WestConnex program of works. One of the objectives of the WestConnex program of works is to enable long-term motorway network development. This includes supporting improved connectivity with future projects including the proposed future Western Harbour Tunnel and Beaches Link program of works, the Sydney Gateway (via the St Peters interchange) and the F6 Extension (via the New M5). The construction and operation of these projects (except for parts of the Western Harbour Tunnel project infrastructure to be constructed by the M4-M5 Link at the Rozelle interchange) do not form part of the M4-M5 Link project and would be subject to their own business case, environmental assessment and planning approval. The M4-M5 Link is not dependent on these future motorway connections proceeding. The EIS includes scenarios in the cumulative impact assessment that consider impacts from other separate projects, however the project is seeking approval for the M4-M5 Link only.

As these proposed future motorway connections mentioned above were still in the early planning stages at the time of the M4-M5 Link EIS, with limited information publicly available, a number of assumptions had to be made to include them in the cumulative operational traffic and noise modelling, as reported on in Chapter 26 (Cumulative impacts) of the EIS, Appendix H (Technical working paper: Traffic and transport) of the EIS and Appendix J (Technical working paper: Noise and vibration) of the EIS.

Since the exhibition of the EIS, a concept design for the Western Harbour Tunnel project is currently being prepared, and a scoping report has been submitted to DP&E with SEARs issued to the proponent on 15 December 2017. The scoping report and SEARs are publicly available online on the DP&E Major Projects website[2]. Work is underway on preparing the EIS for the Western Harbour Tunnel project, which would include assessment of traffic impacts on the surface roads at Rozelle.

C2.1.5 Exclusion of Rozelle Rail Yards site management works

Submitters raised concerns regarding the exclusion of the Rozelle Rail Yards site management works, suggesting that it should have been assessed as part of the Stage 3 [M4-M5 Link] EIS.

Response

As described in section 2.5 of the EIS, the site management works do not form part of the M4-M5 Link project. The site management works are required irrespective of whether the M4-M5 Link project is approved and proceeds. Should the M4-M5 Link project not proceed, the site management works would allow the Rozelle Rail Yards to be more effectively managed prior to another land use being developed in the future.

The site management works were subject to a separate environmental assessment. The works were assessed in a Review of Environmental Factors (REF) (Rozelle Rail Yards – Site Management Works, Review of Environmental Factors (Roads and Maritime 2016), which is available on the Roads and Maritime website[3]. The REF provided an environmental impact assessment and justification for that project. The REF was displayed on public exhibition and a response to submissions report was prepared which is also publicly available. The project was approved by Roads and Maritime under Part 5 of the EP&A Act on 10 April 2017.

The site management works commenced in August 2017 and included site clearing, utility relocation and removal of existing above ground rail infrastructure, including gantries, railway lines, ballast (to a depth of 500 millimetres below ground level), sleepers and buildings. The works are required to manage the existing environmental and safety issues at the site and would facilitate future uses of the site, including the construction of the M4-M5 Link, subject to project approval.

Potential cumulative impacts from the site management works and the M4-M5 Link have been considered in various technical studies in the EIS, with a summary provided in Chapter 26 (Cumulative impacts) of the EIS.

[2] http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8862
[3] http://www.rms.nsw.gov.au/projects/sydney-inner/rozelle-rail-yard-site-management/index.html

C2.1.6 Suitability/independence of EIS consultant

Submitters raised concern regarding the suitability of the EIS consultant. In particular, submitters were concerned with the lead EIS consultant's (AECOM Australia Pty Ltd) involvement due to views held by the submitters that previous traffic modelling undertaken by AECOM has been overestimated. Specific concerns raised included:

- Concern about the lead EIS consultant preparing the response to submissions
- AECOM was criticised for having multiple commercial interests in WestConnex projects
- Concern regarding the continued use of AECOM to complete the Stage 3 M4-M5 Link EIS, as the M4 East and New M5 EISs did not provide enough detail on impacts on communities or predict the difficulties residents would confront in seeking redress against contractors.

Response

The EIS was prepared by a team of qualified professionals and presented a balanced, merit-based environmental impact assessment in accordance with the EP&A Act, the SEARs and applicable NSW assessment policies. The EIS was certified by the EIS Manager prior to display, confirming that the information contained within it was neither false nor misleading, as required by the EP&A Act for all EIS documents.

The EIS included the preparation of a range of comprehensive technical studies (contained in Appendices H to V of the EIS). These technical studies were prepared in accordance with the key issues identified in the SEARs which included requirements issued by key Government regulatory agencies as well as industry standards and guidelines.

The EIS was subject to a legal review and technical review by Roads and Maritime subject matter experts. The traffic and groundwater modelling were also reviewed by independent experts appointed by SMC. The EIS was also peer reviewed by technical specialists engaged by DP&E and the Advisory Committee on Tunnel Air Quality (ACTAQ). Where relevant, peer review comments have been incorporated into this Submissions and preferred infrastructure report. The EIS, including all detailed technical studies, was reviewed by DP&E to confirm that it adequately addressed the SEARs prior to being placed on public exhibition.

The engagement of consultants to undertake the environmental assessment of the M4-M5 Link project was undertaken via a competitive tender process which included assessment against the tender evaluation criteria in accordance with NSW Government procurement processes. AECOM therefore participated in a fair and transparent process to provide professional engineering, technical and environmental services on the different WestConnex projects. The engagement of a specialist consultant to prepare the EIS is consistent with other major transport infrastructure projects of this size and scale.

The preparation of the M4-M5 Link EIS involved a lead EIS consultant and additional specialist consultants including:

- AECOM Australia Pty Ltd (lead EIS consultant and responsible for the traffic and transport, Aboriginal heritage, contamination, soil and water quality, flooding and drainage, groundwater, climate change, greenhouse gas, environmental risk assessment, land use and property and sustainability assessments)
- Pacific Environment Limited (ambient and in-tunnel air quality)
- Stacey Agnew (ventilation)
- SLR Consulting Australia Pty Ltd (noise and vibration risk assessment)
- Environmental Risk Sciences Pty Ltd (human health)
- Hill PDA Pty Ltd (social and economic)
- HydroSimulations (groundwater modelling)
- EcoLogical Australia Pty Ltd (biodiversity)
- GML Heritage Pty Ltd (non-Aboriginal heritage).

In addition, both the SMC and the EIS consultants have engaged probity auditors to ensure probity is maintained with regard to all contracts related to WestConnex.

It is standard practice for the consultant responsible for preparing the EIS for a project to also be involved in preparing the Submissions and preferred infrastructure report. The responses to submissions received have been prepared by AECOM in collaboration with Roads and Maritime and SMC.

Feedback from other SMC project teams, construction contractors, DP&E and other relevant government agencies including NSW Environment Protection Authority (NSW EPA), was sought on the M4 East and New M5 construction phases to identify lessons learnt and areas for improvements to work processes and mitigation measures to assist in developing the concept construction methodology and addressing potential construction impacts for the M4-M5 Link. This is discussed in detail in **section B11.1.4**.

Traffic modelling for the project is undertaken using the WRTM v2.3 which is a strategic model developed and operated by Roads and Maritime. The WRTM provides a platform to understand changes in future weekday travel patterns under different land use, transport infrastructure and pricing scenarios. Although the WRTM is a network-wide model that encompasses existing and future road networks in the Sydney metropolitan area, it was principally developed to assess infrastructure improvements associated with the WestConnex component projects individually and in combination. The WRTM was used for this EIS, and as traffic models undergo constant development and refinement, it is anticipated that future projects would use further iterations of WRTM as they become available. The traffic modelling is as accurate as possible at the time of modelling having been based on the most up to date input information available.

As detailed in section 4.1 of Appendix H (Technical working paper: Traffic and transport) the modelling approach and assessment has been undertaken in accordance with the SEARs which outline the modelling approach to be undertaken for the assessment as well as the guidelines which the assessment needed to follow. The accuracy and reliability of the traffic modelling process is described further in **section B10.8.1**.

C2.1.7 Independent review of WestConnex and the M4-M5 Link

Submitters suggested that independent scrutiny and consultation be undertaken for the project. Submitters also called for an independent review of WestConnex before more money is spent and more residents impacted. Specific concerns include:

- Analysis and models in the EIS should be supported by evidence and empirical data and predicted outcomes should be independently reviewed
- An independent review of the WestConnex program of works should be undertaken due to the refusal to release the business case publicly
- The Auditor-General's report in relation to the assurance processes associated with WestConnex raised serious concerns around the process undertaken to date and the adequacy of the project in terms of governance, independent assurance and justification. The Auditor-General's report suggested four gateway reviews were required but these have not been undertaken
- The project should not proceed until a full inquiry has been made as to the accuracy and integrity of the project.

Response

There has been substantial scrutiny and rigour in the review of the assessments completed for the EIS by independent reviewers including international experts and specialists from NSW Government agencies and bodies. DP&E commissioned independent technical peer reviews of key technical studies presented in the EIS, including the traffic and transport, air quality tunnel ventilation, groundwater and urban design studies. This included a review of modelling, impacts and mitigation measures. Further details are described in **section C8.1**, **section C9.1** and **section C11.1**.

The *WestConnex Updated Strategic Business Case* was independently reviewed by Infrastructure for NSW and Infrastructure Australia. The *WestConnex Updated Strategic Business Case* has been through an externally managed Business Case Gateway Review. This has been carried out in accordance with the recommendation by the NSW Auditor-General that major projects and key documents, such as the *WestConnex Updated Strategic Business Case*, be subject to the Infrastructure Investor Assurance Framework designed by Infrastructure NSW. All relevant information supporting the *WestConnex Updated Strategic Business Case* has been transparently and publicly released, except in limited circumstances where to do so would be contrary to the public interest or position of the State for commercial or legal reasons. Independent reviews of the project and business case is further discussed in **section C3.3**.

The EIS was subject to a legal review and technical review by Roads and Maritime subject matter experts. The traffic and groundwater modelling were also reviewed by independent experts appointed by SMC. The EIS was also peer reviewed by technical specialists engaged by DP&E and ACTAQ. Where relevant, peer review comments have been incorporated into this Submissions and preferred infrastructure report. The EIS, including all detailed technical studies, was reviewed by DP&E to confirm that it adequately addressed the SEARs prior to being placed on public exhibition.

The establishment of an inquiry is beyond the scope of the EIS for the project and is a matter for the NSW Government.

C2.1.8 Inclusion of lessons learnt from previous WestConnex projects

Submitters considered that the EIS ignored problems and issues from other WestConnex projects, such as breaches of construction management plans and previous experiences of Haberfield, St Peters and Granville residents. Specific concerns included:

- There is no evidence that the M4-M5 Link EIS uses data from the real impacts to communities experienced from the M4 East and New M5 projects
- It is not clear how background information and the EIS for the M4 East project, is related to the M4-M5 Link
- The Utilities Management Strategy in Appendix F of the EIS does not provide any confidence that utilities works will be managed differently to the poor management on the M4 East project
- Request for the development of a robust and independent Utilities Management Strategy, and a more robust and better Utilities Relocation Management Plan and Construction Environmental Management Plan (CEMP) than in use for the M4 East and New M5 projects
- The EIS does not indicate how ineffective mitigation measures for the M4 East and New M5 projects (for example, to manage dust, noise and heavy vehicle movements) will be different for this project
- Misuse of authority on critical State significant infrastructure projects.

Response

As discussed in **section C29.1.3** and **section C29.2.3**, specific impacts associated with the construction of the M4 East and New M5 projects are beyond the scope of the M4-M5 Link project. The proponent and design and construction contractor(s) are required to comply with the conditions of approval for these projects (including implementation of measures outlined in the Construction Environmental Management Plan) and requirements of environment protection licences.

Longer duration construction impacts as a result of the M4-M5 Link and M4 East projects at Haberfield/Ashfield and the M4-M5 Link and New M5 projects at St Peters are discussed further in **section C14.12.1**. A number of mitigation measures and strategies are outlined here to address ongoing construction impacts in these areas.

High level background information on the M4 East project is provided in section 4.1.1 of the EIS, as part of an overview discussion on the development of WestConnex, the M4-M5 Link and related projects. Detailed technical information from the M4 East EIS, community feedback raised during the submissions process, and the conditions of approval issued by DP&E, were considered in the M4-M5 Link EIS. Technical information for the Haberfield/Ashfield area informed the baseline descriptions for the M4-M5 Link receiving environment. This is described in the relevant technical working papers in the appendices to the M4-M5 Link EIS. The consideration of community feedback is discussed above. Conditions of approval for the M4 East and New M5 projects informed the environmental management measures for the M4-M5 Link.

The M4-M5 Link EIS includes a Utilities Management Strategy (Appendix F (Utilities Management Strategy), which was developed in accordance with the SEARs and establishes the framework for how utility works for the project will be assessed and carried out. The development of this strategy was in direct response to feedback from the community and stakeholders about impacts from the utility adjustment works being carried out as part of the M4 East and New M5 projects.

Feedback from SMC, contractors, DP&E and other relevant government agencies, including NSW EPA, was sought on the M4 East and New M5 construction processes to identify lessons learnt from these projects. This feedback, together with issues raised by the community during the construction stages of those projects to date and during consultation for the M4-M5 Link, has been considered in the preparation of the EIS, particularly in the assessment of cumulative impacts (refer to Chapter 26 (Cumulative impacts) of the EIS) and in the development of environmental management measures for the M4-M5 Link (see **Chapter E1** (Environmental management measures)).

C2.1.9 Assessment of alternatives

Submitters raised concerns that there had not been a comprehensive discussion of alternatives to the project in the broader community planning context and that there should be independent consideration of alternatives. It was requested that DP&E should reject the EIS and review the processes that led to selecting this project as the option over other alternatives.

Response

The assessment of alternatives has been undertaken in accordance with the SEARs, as provided in Chapter 4 (Project development and alternatives) of the EIS. This describes strategic alternatives to the project as well as various options considered in the project design. See **Chapter C4** (Project development and alternatives) for further responses on consideration of project alternatives.

C2.1.10 Assessment of maintenance activities

Submitters raised concerns regarding the lack of detail surrounding maintenance activities, including at operational complexes. Specifically, submitters were concerned by the lack of detail in the EIS on parking, safety, noise and amenity of the area surrounding the Darley Road motorway operations complex.

Response

As outlined in section 1.3 of the EIS, ongoing motorway maintenance activities during operation do not form part of the project application or assessment in the EIS. Specific environmental impacts from operational activities related to the Darley Road motorway operations complex (MOC1) and other fixed facilities being constructed by the project are discussed in the relevant technical assessment chapters of the EIS. Parking is addressed in Chapter 8 (Traffic and Transport), public safety in Chapter 14 (Social and economic), noise in Chapter 10 (Noise and vibration) and visual amenity in Chapter 13 (Urban design and visual amenity) of the EIS.

C2.1.11 Assessment of alternative construction ancillary facilities

Submitters raised the following concerns and requests regarding construction ancillary facilities at Haberfield and Ashfield:

- The lack of analysis of impacts of a potential hybrid Option A and B construction ancillary facility
- Request that any new sites not assessed in the EIS be subject to a detailed environmental assessment and the information exhibited for public comment
- The EIS does not assess a worst case scenario of possibly using up to five of the identified sites at Haberfield
- The EIS implies that one option which would include three construction sites would be chosen for Haberfield and Ashfield. However the EIS is seeking approval for both options (equalling six construction sites) and then it will be up to the construction contractor to decide on the staged timing and duration of the combined usage
- The assessment and approval process should not proceed without more detailed information about Option A and B being exhibited.

Response

As described in section 6.5.1 of the EIS, 12 construction ancillary facilities have been described and assessed in the EIS, including five sites within Haberfield and Ashfield, being the:

- Wattle Street civil and tunnel site (C1a)
- Haberfield civil and tunnel site (C2a)/ Haberfield civil site (C2b)
- Northcote Street civil site (C3a)
- Parramatta Road West civil and tunnel site (C1b)
- Parramatta Road East civil site (C3b).

To assist in informing the development of a construction methodology that would manage constructability constraints and the need for construction to occur in a safe and efficient manner, while minimising impacts on local communities, the environment, and users of the surrounding road and other transport networks, two possible combinations of construction ancillary facilities at Haberfield and Ashfield were assessed. Part of the justification for the inclusion of the Option B construction ancillary facilities is to minimise the extended duration of construction impacts on receivers adjacent to the Option A sites such as along Wattle Street, Walker Avenue and Northcote Street due to consecutive project construction for the M4 East and M4-M5 Link projects

The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design and would consider the:

- General principles for construction outlined in section 6.1.1 of the EIS
- Environmental performance outcomes stated in Chapter 30 of the EIS and the Submissions and preferred infrastructure report
- Relevant guidelines including noise goals identified in the EIS
- Criteria for final construction site layouts and access arrangements as listed in section 6.5.1 of the EIS
- Environmental management measures identified in **Chapter E1** (Environmental management measures)
- Relevant conditions of approval.

The final construction site layouts and access arrangements would have regard to the amenity criteria in section 6.5.1 of the EIS where practicable, however consideration would be given to the various factors discussed above to determine the most beneficial option.

Based on community feedback and concerns raised in submissions on the EIS, a number of refinements to the construction ancillary facilities at Haberfield and Ashfield have been made to further minimise impacts on the community and sensitive receivers. These include:

- Wattle Street civil and tunnel site – the area at the surface currently being used as a construction zone for the M4 East project would no longer be used. Construction activities would be limited to the Wattle Street entry and exit ramps
- Haberfield civil site – footprint reduced and site to be used as a civil site only as per the arrangement for the Haberfield civil site (C2b). The C2a option would therefore not be used for the construction of the project. No tunnelling from this site is proposed.

The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design and would meet the environmental performance outcomes stated in the EIS and the Submissions and preferred infrastructure report and satisfy criteria identified in any relevant conditions of approval. Further, additional ancillary facilities may be proposed by the contractor, once engaged. Prior to the establishment of ancillary facilities that are not identified in this EIS, the contractor would need to satisfy criteria that would be identified in any relevant conditions of approval and in accordance with an Ancillary Facilities Management Plan.

C2.2 Approval process

2,253 submitters have raised issues regarding the approval process for the project.

C2.2.1 Transparency and adequacy of the approval process for the M4-M5 Link EIS

Submitters expressed concern that the approval process for the M4-M5 Link EIS lacks transparency and accountability. Submitters considered that the planning process is being hastened and is inconsistent. There was concern that the project has not followed the appropriate planning channels and it could not be trusted. In particular, submitters raised the following issues:

- The EIS is a box-ticking exercise which would give the applicant permission to build the M4-M5 link without accountability
- Approval should be based on merit
- Concern that the project would be approved regardless of the validity of objections raised by the community and prior to the final design being made public, which has left communities feeling disempowered
- Residents and businesses are required to adhere to planning controls for their developments; the government is not held to the same planning requirements on this project
- The approval process is being hastened to enable the smooth sale of SMC; due assessment is being compromised by political expediency and budget pressure
- Information about the project has been deliberately withheld from the Freedom of Information view
- The government is 'locking-in' the project before it is adequately assessed. This is evidenced by its appearance in a number of policy documents including the State Infrastructure Strategy
- There is a lack of transparency around the Camperdown construction facility [Pyrmont Bridge Road tunnel site]
- Homes are already being acquired for this project, leading to the conclusion that the approval process is irrelevant
- The process of approving projects through an EIS process is antiquated and is not appropriate for a project of this scale
- The use of 'design and construct' contracts is a tactic to hide the impacts of the project behind commercial in confidence secrecy
- Submitter does not wish for the approval of the project to include tunnelling to assist the Western Harbour Tunnel connection until that project is approved in its entirety
- Submitter proposes improved process for determining State significant infrastructure, that should involve proposals being critiqued at an earlier stage by DP&E followed by an assessment of alternatives
- Part 5 Approvals under the EP&A Act bypass adequate planning control and environmental impact mitigation
- The EIS should assess the proposal and recommend for its refusal if the identified impacts cannot be effectively mitigated
- The tender for Stage 3 [the M4-M5 Link] is planned for early 2018, however consultation will not be held until mid-2018, rendering the consultation meaningless
- The planning process is legally and ethically flawed
- The NSW Government does not have a social licence to proceed with the project, given the number and range of concerns and objections to the project
- The tender process has already begun, despite the project not being approved yet. Submitters are therefore concerned about the genuine character and integrity of the consultation process

- Concerns raised by the City of Sydney Council should be thoroughly investigated through the approvals process.

Response

The assessment and approval process for the M4-M5 Link is being carried out in accordance with the EP&A Act, which governs the planning controls for all developments in NSW. For the M4-M5 Link project, the Minister for Planning is required to determine whether or not to grant approval under Part 5.1 of the EP&A Act following public exhibition of the EIS and consideration of submissions received. Approval for the project is required before construction can commence.

The project has undergone a comprehensive assessment of environmental values and risks as part of the EIS process. The EIS is a public document designed to engage with regulatory agencies, key stakeholders and the general public. Indicative construction designs and construction sites are shown in the EIS, including the Pyrmont Bridge Road tunnel site (C9), as detailed in Chapter 6 (Construction work) of the EIS. Provision of transparent details of the scope of the project in the EIS allows for a greater level of public scrutiny and input into the project development.

The process of land and property acquisition for the project has been initiated with owners, who have been notified as per Roads and Maritime's land acquisition procedures under the *Land Acquisition (Just Terms Compensation) Act 1991*.

Relevant project information has been publicly disclosed by Roads and Maritime in accordance with the *Government Information (Public Access) Act 2009* (NSW). Following the public exhibition of the EIS and consultation period, stakeholder and community submissions were collated and responded to in this Submissions and preferred infrastructure report. In addition, **Part D** (Preferred infrastructure report) has been prepared with consideration of community and agency feedback received outlining design refinements and measures to minimise any identified environmental impacts raised during the assessment of the application. This report will be made publicly available by DP&E.

Consultation with relevant stakeholders and the community occurred during the development of the M4-M5 Link concept design and EIS. Consultation activities continued during the EIS exhibition period between 18 August and 16 October 2017, including community information sessions and stakeholder meetings. Feedback provided by government agencies, local government and the community were recorded and considered during the preparation of the EIS and as part of the development of the project. Further detail on the consultation process and availability of information on the project has been provided in Chapter 7 (Consultation) and Appendix G (Draft Community Consultation Framework) of the EIS. If the project is approved, future consultation will be undertaken with regard to construction activities and the management of impacts. Information on future consultation activities is provided in **Chapter A2** (Community and stakeholder involvement).

Information about the strategic need and justification for the project, and the NSW planning and policy framework underpinning the need for the project is described in Chapter 3 (Strategic context and project need) of the EIS and in **section C3.2.1**.

When considering whether to approve the project, the NSW Minister for Planning will consider, amongst other things, feedback and comments from the community and key stakeholders (including local councils) received during the exhibition period. DP&E's assessment of the project will be set out in the Secretary's Environmental Assessment Report, which will also be considered by the Minister when making a decision of the project. The recommendations made by DP&E (including either conditions of approval or reasons for refusal) will be considered by the Minister before making a decision. The Environmental Assessment Report prepared by DP&E will be made publicly available following the determination of the project.

As the approval authority for the project, the NSW Minister for Planning has the discretion under Part 5.1 of the EP&A Act to refuse or approve the project and to impose such conditions on an approval as the Minister may consider appropriate.

More information about the assessment process for State significant infrastructure, such as the M4-M5 Link, is available on the DP&E website[4].

The design and construct tender procurement process is a common approach to procuring project delivery services for major infrastructure projects, including in NSW. This process does not alter the availability of commercially-sensitive information associated with the project; these details are not applicable to the technical assessment of environmental impacts.

[4] http://www.planning.nsw.gov.au/Assess-and-Regulate/Development-Assessment/Systems/State-Significant-Infrastructure

The sale of SMC has not affected the assessment or preparation of environmental management measures for the project. If the project is approved, it would be approved under section 115W of the EP&A Act, following the full statutory process.

The EIS seeks approval for tunnelling and construction of some elements of the Western Harbour Tunnel project within Stage 2 of the project as outlined in section 2.1 of the EIS. This is with the intent to avoid future disruption to the community and road network in the area around the Rozelle interchange and to assist in delivering the new open space at the Rozelle interchange as early as possible.

The EP&A Act stipulates the approval process for State significant infrastructure projects. Changes to the assessment process are therefore the responsibility of the NSW Parliament and are outside the scope of the project. The current process under the EP&A Act requires the consideration of alternatives and this is considered for the project in Chapter 4 (Project development and alternatives) of the EIS. Concerns regarding the assessment of alternatives are discussed in **section C2.1.9** and **Chapter C4** (Project development and alternatives).

A response to concerns raised by City of Sydney Council is provided in **section B10**.

C2.2.2 Separate approval of the Rozelle interchange

Submitters raised concerns about the complexity of the Rozelle interchange including:

- It should be treated as a separate project, with its own business case and community consultation
- Staging of the M4-M5 Link is intended to attract potential private sector funders would be more willing to invest if they could modify and/or defer the Rozelle interchange
- The project should revert to the initial design which only included the mainline tunnels.

Response

While it is acknowledged that the Rozelle interchange is complex, it has been demonstrated that the infrastructure can been successfully constructed. All components of the interchange (ie surface works and tunnelling) have been comprehensively assessed as part of the M4-M5 Link project in accordance with the requirements of the EP&A Act and the SEARs for the project. The size and complexity of the interchange is the reason it would be delivered separately from the mainline tunnel component of the project. The potential benefits of a staged opening of the project are detailed in section 4.3.2 of the EIS.

Construction of the Rozelle interchange and Iron Cove Link would occur as part of Stage 2 of the project. A more detailed description of what Stage 2 entails, including expected timing of completion, is provided in section 6.1.2 of the EIS. Further responses to issues around construction staging are provided in **section C6.1.2**.

The detailed design and construction of the Stage 2 works would be contracted separately to the Stage 1 mainline tunnel works. Any potential modifications or design refinements to the Rozelle interchange, made during the detailed design phase, would be subject to further assessment and approval, if required.

C2.2.3 Adequacy of timing and duration of EIS exhibition

Concerns were raised that the public exhibition period of 60 days was inadequate to prepare meaningful submissions, given the length and complexity of the EIS. It was also pointed out that the public exhibition period occurring during school holidays affected the ability of the public to make meaningful submissions and that the timing of the exhibition period warranted a longer exhibition period. As such, submitters:

- Requested an extension of the EIS public exhibition period, to 90 days or once more accurate designs have been provided
- Queried why requests from councils for time extensions were not granted
- The Auditor General announced a second audit of WestConnex. Exhibition should be extended until the Auditor General's investigation has been completed.

Response

Under the EP&A Act, the Secretary of DP&E is responsible for determining the timing and duration of public exhibition periods for environmental impact statements. In the case of the project, the Secretary determined to extend the public exhibition period from the minimum statutory period of 30 days to a total of 60 days (18 August to 16 October 2017). This exhibition period considered school holidays and the length and complexity of the EIS documentation, and was the same for both community members and key stakeholders such as councils.

As described in **Chapter A2** (Community and stakeholder involvement), consultation activities continued during the EIS exhibition period, including community information sessions and stakeholder meetings to assist the community and key stakeholders to understand the EIS. If the project is approved, future consultation will be undertaken with regard to construction activities and the management of impacts.

The exhibition period for the M4-M5 Link project is in keeping with or greater than other recent infrastructure projects in NSW that are of a similar scale. The exhibition period for a selection of these recent major projects are listed in **Table C2-1**.

Table C2-1 Exhibition period for other projects

Project	EIS exhibition period
Sydney Metro City and Southwest – Stage 1: Chatswood to Sydenham	41 days
Parramatta Light Rail	53 days
M4 East	55 days
New M5	64 days (exhibited over the Christmas/ New Year period)
NorthConnex	60 days

The Audit Office of NSW has announced its intention to audit the WestConnex program of works for a second time. This process is separate to the planning process for the project and is therefore not relevant to the timing of the EIS exhibition period.

C2.2.4 Timing of EIS document release

Submitters raised concerns about the integrity of the EIS process, with the release of the EIS only 14 days after the period for comment on the concept design closed. Submitters did not believe it was possible that the comments were reviewed, assessed and incorporated into the EIS in that time.

Response

Prior to the statutory exhibition period for the EIS, non-statutory consultation on the M4-M5 Link concept design was carried out during a 12-week period between May and August 2017. This consultation period sought to provide the community and other stakeholders with information about the M4-M5 Link project before the release of the EIS, as well as the opportunity to provide feedback. A community feedback report that addresses the main themes of feedback received during this period was prepared and made publically available on the WestConnex website, and included reference to where issues raised were addressed in the EIS.

It is acknowledged that the time period between the close of comments on the concept design and the exhibition of the EIS was limited. Comments received during the concept design consultation period were considered on a broad scale in the EIS. Comments and issues raised at the five community sessions at Camperdown, Leichhardt, Newtown, Balmain and Haberfield and from other stakeholder meetings were also progressively forwarded to the EIS team throughout the consultation period on the concept design. The EIS team were therefore made aware of key issues prior to the close of the submissions period on the Concept Design Report.

The consultation prior to and during design development and EIS preparation, including the timing of the public release of the concept design and incorporation of community feedback is discussed in **section C7.1** and **Chapter A2** (Community and stakeholder involvement).

C2.2.5 Public exhibition of the preferred infrastructure report

Submitters raised concerns about the approval of the project without providing opportunities for public comment on the referred infrastructure report, noting the uncertainty surrounding the planning and details of the project. Submitters suggested that there should be an additional layer of planning approvals for the preferred infrastructure report, to appease concerns regarding probity and governance around the approval of the project.

Response

A preferred infrastructure report has been prepared (see **Part D** (Preferred infrastructure report) that outlines the design refinements and measures to minimise any identified environmental impacts raised during the assessment of the application, with consideration of community and stakeholder feedback received.

The preferred infrastructure report provides a description and assessment of the following proposed changes to the project as assessed in the EIS:

- An additional construction ancillary facility at Rozelle near White Bay, to the east of the White Bay Power Station on land owned by the Port Authority of NSW, to support truck marshalling and construction workforce parking for the project – the White Bay civil site (C11)
- Relocation of the bioretention facility at Rozelle from within the informal car park adjacent to Manning Street as proposed in the EIS, to around 150 metres north within King George Park adjacent to Victoria Road at the eastern abutment of Iron Cove Bridge.

Exhibition of the preferred infrastructure report for public comment is at the discretion of the NSW Minister for Planning.

C2.2.6 Approval conditions

Submitters suggested specific approval conditions they believed should be included within the approval of the M4-M5 Link. It was requested that current WestConnex projects modify practice through revised conditions of approval and that the M4-M5 Link operate under more stringent and socially responsible practices. There was concern that the approval conditions would be too broad and lead to issues of non-compliance due to the EIS being indicative only.

Conditions of approval were suggested to be developed in consultation with local councils and other relevant stakeholders. It was requested that the word ‘reasonable’ not be used in conditions of approval as it is too general and non-specific. Specific approval conditions requested include:

- An active transport strategy for the cycle network within the M4-M5 Link project footprint should be included as a condition of approval
- A condition of approval should be included for an agreement with Roads and Maritime to construct a cycleway from Iron Cove to the Rozelle Rail Yards
- Elements of the project that are funded by other authorities, such as bicycle facilities, should be included in the approval conditions
- Specific and measurable noise mitigation measures should be mandated and enforced through approval conditions
- There should be no commencement of works unless mitigation measures are available and ready to be installed, specifically for noise and dust
- Improved communications and complaints mechanisms are developed and implemented
- A local project public liaison officer should be available at every construction site or area
- An independent complaints Ombudsman should be appointed
- The DP&E should establish and oversee neighbourhood group meetings and liaison between local residents with relevant construction and project employees
- The construction contractor should finance regular resident drop-in sessions with relevant compliance teams and WestConnex representatives
- Appropriate independent regulatory, supervision and compliance resources should be provided, funded by the proponent

- Regular disability audits from a qualified person/service regarding all aspects of project impacts in local communities should be conducted
- Approval conditions of this project should inform best practice for future projects to operate with more stringent practices
- Approval conditions for this project should be more robust than those adopted on preceding WestConnex projects
- The alternative access into the Darley Road ancillary construction facility should be confirmed. No spoil trucks should be permitted to access Darley Road
- A reasonable and enforceable limit on the number of nights of out-of-hours work at Darley Road should be put in place and the proponent should pay a predetermined amount of ex gratia payment to residents for each night of disturbance
- Road closures should be considered in consultation with affected residents around Darley Road
- Utilities work should be undertaken during business hours Monday to Friday and Saturday morning
- Appropriate independent regulatory, supervision and compliance resources should be funded by the proponent
- Approval conditions regarding utility works need to be more robust than those for M4 East and New M5.

Response

When considering whether to approve the project, DP&E will consider, amongst other things, feedback and comments from the community and key stakeholders (including local councils) received during the exhibition period. DP&E's assessment and recommendation will be set out in the Secretary's Environmental Assessment Report. The recommendation (including either conditions of approval or reasons for refusal) will be considered by the NSW Minister for Planning before making a decision to approve or not approve the project.

As the approval authority for the project, the NSW Minister for Planning has the discretion under the EP&A Act to refuse or approve the project and to impose such conditions on an approval as the Minister may consider appropriate.

Any conditions of approval suggested by the community and agencies would be initially considered by the Secretary of DP&E and then the NSW Minister for Planning when determining the project. The conditions of approval are required to:

- Prevent, minimise, and/or offset adverse environmental impacts including economic and social impacts
- Set standards and performance measures for acceptable environmental performance
- Ensure regular monitoring and reporting
- Provide for the ongoing environmental management of the State significant infrastructure.

Roads and Maritime has considered all the conditions of approval suggested in the submissions in its review of the environmental management measures for the project and has updated environmental management measures as appropriate. The environmental management measures for the project as outlined in **Chapter E1** (Environmental management measures) were also formulated with consideration of the approval conditions determined for the M4 East and New M5 projects. The project environmental management measures would form the minimum requirements for the conditions of approval.

C2.3 Statutory requirements

76 submitters have raised issues regarding the statutory requirements for the project.

C2.3.1 Project compliance with statutory regulations

Submitters have raised concerns that the project does not satisfy statutory regulations and frameworks. Specific concerns include:

- Integration with local, state and federal statutory regulations
- Compliance with environmental laws and regulations, specifically the EP&A Act (section 148B) and Protection of the Environment Operations (Noise Control) Regulation 2017 (NSW)
- Compliance with the *Work Health and Safety Act 2011* (NSW)
- Failure to adhere to the Web Content Accessibility Guidelines 2.0 AA Standards in the display of the EIS, breaching the *Anti-Discrimination Act 1997* (NSW)
- Breaches the overarching State Environmental Planning Policy No. 33— Hazardous and Offensive Development
- Failure to comply with the Australian Consumer Law, section 18
- Integration with wider land use systems and the strategic direction of local governments
- Compliance with NSW EPA licensing.

Response

The project has been assessed under Division 2, Part 5.1 of the EP&A Act as State significant infrastructure and also critical State significant infrastructure. The EIS was certified by the EIS Manager prior to public exhibition, confirming that the information contained within it was neither false nor misleading, as required by section 148B of the EP&A Act and in line with the Australian Consumer Law section 18. The EIS was exhibited online on the DP&E Major Projects website and in hardcopy in accordance with relevant guidelines, including web accessibility (Web Content Accessibility Guidelines 2.0 AA Standards), as described in **section C7.2.2**. The relevant provisions of the EP&A Act have been applied to this project consistent with the application of the provisions to other state significant infrastructure and critical State significant infrastructure project.

As discussed in Chapter 2 of the EIS, Section 115ZF of the EP&A Act excludes the application of environmental planning instruments, including local environmental plans (LEPs) and development control plans, to State significant infrastructure projects (except as those instruments apply to the declaration of significant infrastructure projects or critical significant infrastructure projects. Notwithstanding the above, the provisions of the following LEPs in relation to impacts to land use zoning were considered in Chapter 12 of the EIS:

- Ashfield Local Environmental Plan 2013
- Leichhardt Local Environmental Plan 2013
- Marrickville Local Environmental Plan 2011
- Sydney Local Environmental Plan 2012
- Sydney Regional Environmental Plan No. 26 – City West (SREP 26).

In addition, the following State environmental planning policies (SEPPs) and deemed SEPPs were considered (as detailed in section 2.2.1 of the EIS) to be consistent with good environmental assessment practice:

- State Environmental Planning Policy (Infrastructure) 2007
- State Environmental Planning Policy No. 19 – Bushland in Urban Areas
- State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
- State Environmental Planning Policy No. 55 – Remediation of Land
- Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005

- Sydney Regional Environmental Plan No. 26 – City West.

The State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33) is not strictly applicable to infrastructure such as this project. However, the provisions of the policy are considered in Chapter 25 (Hazard and risk) of the EIS in relation to the storage of hazardous substances and dangerous goods during the construction and operation of the project.

Approvals under NSW legislation that apply to the project include:

- An Environment Protection Licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (NSW) (POEO Act). In accordance with clause 35 of Schedule 1 of the POEO Act an Environment Protection Licence would be required for construction of the project. In accordance with section 115ZH of the EP&A Act, such a licence cannot be refused for an approved project and is to be substantially consistent with any approval granted to the project under Part 5.1 of the EP&A Act
- The *Land Acquisition (Just Terms Compensation) Act 1991* (NSW), which applies to the acquisition of any land by an Authority of the State
- The *Contaminated Land Management Act 1997* (NSW), which outlines the circumstances in which notification of the NSW Environment Protection Authority is required in relation to contamination of land
- The *Roads Act 1993* (NSW), as the project would result in a road classified as a freeway or tollway under the Act
- The *Fisheries Management Act 1994* (NSW), as dredging or reclamation works are required in water land classed as key fish habitat
- The *Crown Lands Act 1989* (NSW), which applies to the acquisition of land reserved under that Act.

The Protection of the Environment Operations (Noise Control) Regulation 2017 (NSW) aims to limit the amount of community noise in neighbourhoods. It applies to typical noise sources in residential areas, such as power tools, garden equipment, air conditioners, sound systems, motor vehicles and marine vessels. The regulation does not apply to infrastructure projects.

The applicability of relevant commonwealth legislation to the project was considered in section 2.4 of the EIS including the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) and the *Airports Act 1996* (Commonwealth).

An Environment Protection Licence (EPL) is issued by the NSW EPA for the construction and/or operation of a project once it has been approved. It is anticipated that an EPL would be issued for the project if it is approved.

Strategic planning documents, including urban renewal transformation plans considered in the planning of the project were discussed in Chapter 3 (Strategic context and project need) of the EIS.

The SEARs require that the EIS, including environmental management measures, be prepared in accordance with all relevant environmental and workplace health and safety legislative requirements.

C2.4 Post approval pathways

1,656 submitters raised issues regarding the pathway for changes to the project following approval.

C2.4.1 Clarity about post approval changes to the concept design

Submitters raised concern about changes to the concept design and construction methodology following approval of the EIS and appointment of a contractor. Concerns relate to the amount of change expected between concept and detailed design, and opportunities for public comment. Specific concerns raised include:

- The public and councils will have no right to information or feedback post-appointment of construction contractors. There is concern that this is the stage where risks and mitigation measures will be properly identified
- A modification could be made to introduce a portal at Camperdown at the Pyrmont Bridge Road tunnel site

- Modifications could be made to the existing location of utility services at the discretion of the construction contractor
- The mainline tunnel alignment would differ to the indicative footprint released in the concept design
- Queried what measures are in place to ensure contractors deliver on the intentions/design in the EIS
- Questions what will guarantee the delivery of green space and adherence to a below-ground interchange design.

Response

The design and construction contractor(s) will be appointed to undertake the detailed design and construction planning of the M4-M5 Link following determination of the project application, should it be approved. Section 1.1 of the EIS provides further detail of the delivery mechanism for the project.

The detailed design will be prepared based on the approved project as described in the EIS and this Submissions and preferred infrastructure report and will be consistent with any conditions of approval and other requirements of DP&E, if approved. Where the detailed design is inconsistent with the approved project, further assessment and approval will be taken as required by the EP&A Act. If further assessment/approval is required due to project design changes, the applicable statutory process will be followed prior to commencement of construction or operation of the relevant aspect of the project. This may be in the form of a modification to the Instrument of Approval under section 115Z1 of the EP&A Act, depending on the scale of the proposed modification and the potential for environmental or social impacts.

The concept design used a conservative approach and project footprint for assessment of project risks and impacts. During detailed design, the design and construction contractor(s) will identify improvements to deliver the project, however, the design presented by the design and construction contractor(s) will need to satisfy all technical road design requirements and road functionality as described in the EIS, and be consistent with the approved scope of the project, including environmental management measures and conditions of approval for the project. Issues raised during public exhibition of the EIS will also be taken into account during the detailed design process.

If further assessment/approval is required due to project design changes, the applicable statutory process will be followed prior to the commencement of construction of the relevant aspect of the project. This may be in the form of a modification request lodged with DP&E, depending on the scale of the proposed modification and the potential for environmental or social impacts. The modification request would be appropriately notified and/or exhibited by DP&E, if deemed necessary.

Certain aspects of the detailed design of the project would be made available to the public for input including the UDLPs and the Social Infrastructure Plan. These plans will be prepared in consultation with relevant councils, stakeholders and the community (see environmental management measures UD1 and OSE8 in **Chapter E1** (Environmental management measures)). Ongoing consultation with the community will be undertaken in accordance with a Community Communication Strategy, which includes mechanisms for notification and feedback.

Prior to carrying out any utility relocation works before the Construction Environmental Management Plan (CEMP) is approved, the proponent will prepare and implement a Utility Relocation Management Plan which outlines the environmental management practices and procedures for the utility relocations. This plan would inform the Utility Co-ordination Committee (further discussion is provided in **section B11.6.5**).

The project would deliver up to 10 hectares of open space at the Rozelle Rail Yards as part of the development of the Rozelle interchange, as committed to by the NSW Government (announced in July 2016).

C2.4.2 Implementation of the EIS and environmental management measures

Submitters raised concerns that the environmental management measures raised in the EIS would not be implemented post approval, with concerns regarding the management of contractors and compliance with conditions of approval, specifically during construction. Specific concerns include the following:

- Preceding stages of WestConnex have created a poor reputation for mitigation compliance

- Additional mitigation measures identified through the submissions process would not be implemented
- Conditions of approval should be reviewed regularly for relevance and revised, especially in response to resident's experiences
- Construction contractors would not be held to account by any authority to mitigate impacts on residents
- The contractors should be required to meet more than the minimum standards of compliance, and performance assurance standards should be used to rate the contractor's performance
- The construction timeline may not be adhered to by the appointed construction contractors
- The contractor will not be able to prevent sub-contractors using local roads
- The Construction Settlement Monitoring Program being the responsibility of the construction contractor would be a conflict of interest
- Who would take responsibility for compensation in the event of tunnelling impacts in the same area for the M4-M5 Link and Sydney Metro City and Southwest
- Who would be responsible for damage and managing future assessments of EIS requirements and compliance, such as undertaking precondition surveys and ongoing monitoring of settlement
- Sanctions for WestConnex contractors are weak and quantifiable financial consequences for breaching conditions of approval should be implemented
- The asset owner should include financial responsibility for mitigation of long term health impacts
- Local governments or other independent bodies should be involved in compliance activities
- DP&E does not have the powers to enforce compliance with conditions of approval.

Response

Should the project be approved, the proponent (Roads and Maritime) and appointed contractors and sub-contractors must comply with all requirements of the conditions of approval for the project. This will require implementing all of the environmental management measures described in this report and other feasible and reasonable measures to prevent and/or minimise any harm to the environment that may result from the construction or operation of the project.

For the M4-M5 Link project, the design and construction contractor(s) will be appointed to undertake the detailed design and construction planning for the project, should it be approved. The design presented by the design and construction contractor(s) would need to be consistent with any environmental management measures described in **Chapter E1** (Environmental management measures) to mitigate impacts from the construction and operation of the project such that health, social and economic, land use and environmental impacts are minimised. The environmental management measures detail the specific monitoring programs that are proposed to be implemented to ensure compliance, including for noise and vibration, and ground settlement.

Long term health impacts have been assessed (refer to Chapter 11 (Human health risk) and Appendix K (Technical working paper: Human health risk assessment) of the EIS) and found that potential changes in air quality as a result of the project presented an acceptable risk to human health in accordance with the relevant criteria or guidelines. Financial responsibility for long term health impacts is therefore not expected to be required.

The development of the environmental management measures considered the approval conditions determined for the M4 East and New M5 projects. The environmental management measures include a number of sub-plans to be prepared as part of the CEMP in consultation with relevant councils and stakeholders, including traffic and access management. These would be required to be adhered to by the design and construction contractor(s) and associated sub-contractors.

Rectification of damage to property during the construction of the project due to general construction activities would be the responsibility of the design and construction contractor(s) for the project.

During detailed design, a settlement and vibration assessment would be carried out by the design and construction contractor(s) in consultation with Transport for NSW to establish appropriate technical criteria. A Settlement Monitoring Program would also be implemented during construction to validate or reassess the predictions should it be required. The M4-M5 Link project would be managed to comply with the conditions of approval, settlement criteria and environmental management measures provided in **Chapter E1** (Environmental management measures). The Sydney Metro City and Southwest ground settlement would be managed to comply with its relevant conditions of approval. Cumulative subsidence/settlement impacts with the Sydney Metro tunnel and the M4-M5 Link is discussed in **section C12.11.1**.

The proponent will establish an independent Property Impact Assessment Panel comprising of geotechnical and engineering experts independent of the design and construction team before relevant works commence. The panel will be responsible for independently verifying building condition survey reports, the resolution of property damage disputes and the establishment of ongoing settlement monitoring requirements (see environmental management measure PL11 in **Chapter E1** (Environmental management measures)).

The design and construction contractor(s) will be responsible for the implementation of the conditions of approval, overseen by the proponent (Roads and Maritime), who will be responsible for any breaches of the conditions of approval resulting from the actions of contractors, sub-contractors and visitors. Roads and Maritime will ensure conditions of approval are followed through by the implementation of a compliance tracking program to track and monitor compliance with the conditions of approval for the duration of construction and for a minimum of one year following commencement of operation. A pre-construction compliance report will be prepared and detail how the conditions of approval will be complied with, and what actions will be taken to rectify non-compliance. Construction would not commence until this report is approved by the Secretary.

A suitably qualified and experienced environment representative who is independent of the design and construction personnel will be nominated by the proponent, approved by the Secretary and engaged for the duration of construction. The approved environment representative will consider and recommend any improvements that may be made to work practices to avoid or minimise adverse impact to the environment and community, and will regularly monitor the implementation of all documents prepared under the conditions of approval.

In addition to the compliance tracking program, the conditions of approval will include an environmental audit program for independent environmental auditing in accordance with AS/NZS ISO 19011:2014 – Guidelines for Auditing Management Systems, and provide relevant procedures for reporting and rectifying incidents and any non-compliance identified.

The DP&E and NSW EPA compliance teams undertake inspections to ensure projects meet the strict conditions included in their approvals and relevant licences. This team works closely with the community, local councils and other state and federal government agencies to investigate potential breaches and carry out enforcement where necessary. Enforcement can range from negotiating practical solutions to issuing penalty notices and, in serious cases, criminal prosecutions.

C2.4.3 Additional unassessed construction facilities

Submitters raised concerns that the EIS states that contractors may decide on additional construction ancillary facilities to the 12 identified in the EIS. Submitters were concerned that if contractors decide on additional construction ancillary facilities, residents would not have the opportunity to comment on their impacts. Submitters suggested that an approval condition should limit construction ancillary facilities to those already identified in the EIS, or if an option not outlined in the EIS was the preferred option, then traffic, noise and air quality modelling should be undertaken and released for community consultation.

Response

Roads and Maritime is seeking approval for construction ancillary facilities which are identified in the EIS and in **Part D** (Preferred infrastructure report).

Further, additional ancillary facilities may be proposed by the design and construction contractor(s). Prior to the establishment of ancillary facilities that are not identified in this EIS, the contractor would need to satisfy any relevant conditions of approval.

The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design and would meet the environmental performance outcomes stated in the EIS and the Submissions and preferred infrastructure report and satisfy criteria identified in any relevant conditions of approval. Further, additional ancillary facilities may be proposed by the contractor, once engaged. Prior to the establishment of ancillary facilities that are not identified in this EIS, the contractor would need to satisfy criteria that would be identified in any relevant conditions of approval and in accordance with an Ancillary Facilities Management Plan.

In accordance with section 115Z(6) of the EP&A Act, a preferred infrastructure report has been prepared for the project. This report explains changes or refinements that have been identified to minimise environmental impacts or to address issues raised during exhibition of the EIS (see **Part D** (Preferred infrastructure report). This report assesses a truck marshalling yard and construction workforce parking at the White Bay civil site (C11) which would be an additional construction ancillary facility that has been proposed since exhibition of the EIS.

As outlined in **section A2.5**, SMC and Roads and Maritime will continue to consult with the community and other key stakeholders during the ongoing refinement of the design and during construction, with a view to further minimise impacts of the project on communities.

C3 Strategic context and project need

This chapter addresses issues raised in community submissions associated with the strategic context and project need of the M4-M5 Link project. Refer to Chapter 3 (Strategic context and project need) of the Environmental Impact Statement (EIS) for further details on the strategic context and need for the project.

Contents

C3.1 Strategic planning and policy framework

204 submitters raised issues regarding the strategic planning policy framework discussed in the EIS. Refer to section 3.1 of the EIS for details of the strategic planning policy framework for the M4-M5 Link project.

C3.1.1 Project does not adhere to the stated policy framework

Submitters raised concerns regarding the planning policy framework discussed in the EIS and that there is a lack of alignment and consistency with the NSW Government's priorities and policies. Submitters raised the following specific issues:

- The project is not consistent with the Greater Sydney Commission's plans and policies (including District Plans), the Parramatta Road regeneration strategy [the *Parramatta Road Corridor Urban Transformation Strategy*], the Smart Cities and Suburbs Initiative, 100 Resilient Cities Project, *A Plan for Growing Sydney*, the *NSW Long Term Transport Master Plan (Transport Master Plan)*, and Sydney's Green Grid concept
- The project should be put on hold until finalisation of Sydney's Transport Future [the *Draft Future Transport Strategy 2056*], the Greater Sydney Commission's District Plans and the Draft Greater Sydney Region Plan
- The project is inconsistent with UrbanGrowth NSW policy - *The Bays Precinct Transformation Plan*. The project would take land intended for housing and employment specified in the plan
- The project would add complexity and cost to future transport options which are government commitments eg Sydney Metro West
- The project provides no certainty to the various planning strategies, departments and other stakeholders currently developing plans for urban renewal, housing, employment and public open space for the area around the Rozelle Rail Yards.

Response

Existing and draft NSW Government policies, plans and programs relevant to the nature of the project and the project footprint were assessed in Chapter 3 (Strategic context and project need) of the EIS. The assessment considered potential positive and negative effects of the project on policy decisions and government initiatives. The project is considered to be consistent with all applicable government policies, plans and programs with respect to transport infrastructure, urban growth initiatives and connectivity.

The project is listed as a 'high priority initiative' in the *Australian Infrastructure Plan: The Infrastructure Priority List* (Infrastructure Australia 2016). The project is also part of the NSW Government's commitment to deliver WestConnex for Sydney in response to the recommendations from the *State Infrastructure Strategy 2012-2032* (Infrastructure NSW 2012), the *State Infrastructure Strategy Update* 2014 (Infrastructure NSW 2014), the *Transport Master Plan* (Transport for NSW 2012), the *NSW State Priorities* announced in September 2015 (NSW Government 2015) and the *NSW Freight and Ports Strategy* (Transport for NSW 2013).

The WestConnex program of works, which includes the project, has the potential to be a catalyst for major urban renewal and complements *A Plan for Growing Sydney* (NSW Government 2014) and the *Draft Central District Plan*[1] (Greater Sydney Commission 2016). The project also complements the vision established in the *Draft Towards our Greater Sydney 2056* (Greater Sydney Commission 2016) and the draft *District Plans* (Greater Sydney Commission 2016), specifically the *Draft Central District Plan,* by providing one component of an integrated transport solution being delivered to by the NSW Government to support population and commercial growth in western Sydney and addresses the broader transport challenges of a growing Sydney.

[1] Note that this draft plan was replaced by the *Revised Draft Eastern City District Plan* (Greater Sydney Commission 2017) after the EIS was exhibited

The Sydney Green Grid plan has been considered in developing the initial urban design and landscaping concepts for the project, as outlined in Appendix L (Technical working paper: Urban design) of the EIS. The Sydney Green Grid would be considered further in the development of the Urban Design and Landscape Plans (UDLPs) for the project, including the urban design and landscape works for the Rozelle Rail Yards.

Chapter 27 (Sustainability) of the EIS discusses the relevance of the 100 Resilient Cities initiative and how the project is consistent with the outcomes of the Resilient Sydney project. The project would contribute to building the resilience of metropolitan Sydney by addressing some of the key chronic stresses facing the city, including the need for improved connectivity and reduced congestion (refer to section 27.4.2 of the EIS). The project's resilience to future climate change is described in Chapter 24 (Climate change risk and adaptation) of the EIS.

The Smart Cities and Suburbs program, an Australian Government initiative formally launched in 2017, aims to support the delivery of innovative, smart city projects to improve the liveability, productivity and sustainability of cities and towns across Australia, through the provision of funding. The Smart Cities and Suburbs program is a component of the *Smart Cities Plan*[2] (Australian Government 2016). The project would be consistent with the following aspects of the *Smart Cities Plan*:

- Supporting access to jobs
- Providing green urban spaces
- Relieving urban congestion
- Prioritising projects that meet broader economic objectives such as long term growth and job creation.

Since the preparation of the EIS, the *Draft Future Transport Strategy 2056* (NSW Government 2017) was released for public comment in tandem with the *Draft Greater Sydney Region Plan* (Greater Sydney Commission 2017). The *Draft Future Transport Strategy 2056* is an update of the *Transport Master Plan* and sets the vision, direction and outcomes framework for commuter mobility in NSW and aims to guide transport investment over the longer term. The draft strategy identifies the WestConnex program of works, which includes the project, as a 'city-shaping' project. The draft strategy is underpinned by the *Draft Greater Sydney Services and Infrastructure Plan* (Greater Sydney Commission 2017) which states that:

- Roads will continue to have an important role to play in Greater Sydney, supporting freight, on-road public transport and trips best served by car
- The road network in Greater Sydney is the city's largest transport asset and carries the majority of the Greater Sydney's transport and freight task
- A number of committed initiatives will support the expansion of the strategic road network, including WestConnex, NorthConnex and the Western Sydney Infrastructure Plan.

The *Draft Greater Sydney Region Plan* sets the vision for a growing and changing Greater Sydney and its transformation into a 'metropolis of three cities', based around the Sydney central business district (CBD), Parramatta and the Western Sydney Airport-Badgerys Creek areas. The draft plan proposes that urban renewal investigation opportunities consider alignment with key infrastructure, such as the WestConnex program of works, to ensure connectivity between these cities.

The project, as part of the WestConnex program of works, is therefore consistent with the vision outlined in both the *Draft Future Transport Strategy 2056* and the *Draft Greater Sydney Region Plan.* These draft plans are anticipated to be finalised in 2018.

Investment in the M4-M5 Link, together with the other WestConnex projects, would assist in facilitating land use outcomes identified in strategic planning documents, such as the *Parramatta Road Corridor Urban Transformation Strategy* and *The Bays Precinct Transformation Plan*, by reducing traffic on surface roads, providing opportunities for public transport improvement on key transport corridors, improving connectivity and providing new open space and active transport links, which would all contribute to delivering economic growth. As part of the broader WestConnex program of works, the project would support NSW's major sources of economic activity and provide a strategic response to the future transport demands on the already congested road network.

[2] https://cities.dpmc.gov.au/smart-cities-plan

Delivery of *The Bays Precinct Transformation Plan* is intended to be staged and coordinated with the planning and delivery of infrastructure projects including WestConnex. NSW Roads and Maritime Services (Roads and Maritime) and UrbanGrowth NSW are in regular dialogue around opportunities for greater synergy between the project and the various strategies proposed to guide future development at The Bays Precinct, including the future development of the White Bay Power Station. As discussed in greater detail in **section C4.9**, the NSW Government announcement in July 2016 to develop the Rozelle Rail Yards for the Rozelle interchange, including the delivery of up to 10 hectares of open space, means that certain aspects of The Bays Precinct Transformation, such as housing development and employment uses at the Rozelle Rail Yards, would not be possible if the project goes ahead. However, the project would not preclude development in other precincts within The Bays area where housing development and employment uses are identified as an objective. The project would support the realisation of *The Bays Precinct Transformation Plan* by providing new amenity for future residents and workers, including new open space and improved pedestrian and cyclist connections within and around the Rozelle Rail Yards. The forecast reduction in daily traffic volumes would support the objectives for improved connectivity, potentially enabling public transport improvements along this section of Victoria Road and supporting the movement of traffic to and from The Bays Precinct.

The project provides certainly for the development of land subject to the project at and around the Rozelle Rail Yards. This land would be developed for the project in a timeframe that is consistent with that outlined for the Rozelle Rail Yards precinct in *The Bays Precinct Transformation Plan*. Roads and Maritime will continue ongoing consultation with Transport for NSW around proposed public transport initiatives such as Sydney Metro West and potential public transport improvements along Parramatta Road and Victoria Road, to ensure that the M4-M5 Link and other proposed projects can be delivered safely and effectively.

C3.1.2 Integration of land use and transport planning

Submitters requested evidence of the integration of land use and transport planning in the M4-M5 Link project. Specifically, submitters were concerned that the future development of The Bays Precinct would add to congestion issues. Specific concerns related to an integrated active transport planning and delivery program being included to ensure the delivery of active transport links to surrounding areas and through the Rozelle Rail Yards. This includes projects like the Cooks River to Iron Cove Greenway.

Response

The Bays Precinct Transformation Plan establishes the strategy for how The Bays Precinct would be developed over 20 years for residential, employment, entertainment and open space uses. The Bays Precinct, located about two kilometres west of the Sydney CBD, encompasses the areas surrounding Blackwattle Bay, Rozelle Bay and White Bay. The Bays Precinct comprises eight 'destinations', including the Rozelle Rail Yards, White Bay Power Station, White Bay and the Rozelle Bay and Bays Waterways (refer to section 3.1.2 of the EIS).

The NSW Government's ambition for The Bays Precinct is 'to drive an internationally competitive economy, through the creation of great destinations on Sydney Harbour that would transform Sydney, NSW and Australia' (UrbanGrowth NSW 2015b). The NSW Minister for Planning has determined that the urban renewal of land within The Bays Precinct is a matter of state planning significance and has agreed to investigate the area as a State Significant Precinct. Refer to Chapter 2 (Assessment process) of the EIS for additional information on the planning implications of this proposed designation.

Delivery of The Bays Precinct is intended to be staged and coordinated with the planning and delivery of WestConnex and the expansion of the Sydney Light Rail network as well as the long term considerations of The Bays Precinct's port uses. *The Bays Precinct Transformation Plan* recognises that an efficient transport system enables urban transformation, and that transport solutions for The Bays Precinct would need to be integrated with planning for a growing Sydney, including the consideration of varied transport modes.

The Bays Precinct Transformation Plan identifies the Rozelle Rail Yards as providing an opportunity for mixed housing as well as public spaces and employment uses. *The Bays Precinct Transformation Plan* also identifies the potential for opportunities provided by the redevelopment of the Rozelle Rail Yards for integration and connection of communities to the north and south through the creation of public open space and improved connections between Lilyfield and the waterfront.

The traffic assessment for the M4-M5 Link project use the WestConnex Road Traffic Model (WRTM) which is based on land use, population and employment forecasts provided by the NSW Department of Planning and Environment (DP&E). The traffic assessment provided in Appendix H (Technical working paper: Traffic and transport) of the EIS included allowance for growth from a number of large scale urban development projects such as *The Bays Precinct Transformation Plan* and *Parramatta Road Corridor Urban Transformation Strategy.*

While the project is consistent with *The Bays Precinct Transformation Plan* vision for the creation of new open spaces, provision of new pedestrian and cyclist links, and the acknowledgment of the rail heritage of the area, it is inconsistent with the Plan with respect to the future development of the Rozelle Rail Yards for mixed housing. The project would deliver up to 10 hectares of new open space and active transport links for the community at the Rozelle Rail Yards as part of the development of the Rozelle interchange, as committed to by the NSW Government (announced in July 2016). Further details on active transport links at the Rozelle Rail Yards are shown in Appendix N (Technical working paper: Active transport strategy) of the EIS.

C3.2 Project need and justification

3,173 submitters raised issues regarding justification and need for the project. Refer to section 3.2 of the EIS for details of the project need and justification. Chapter 30 (Project justification) of the EIS provides a summary of the strategic need and justification including the manner in which the project would fulfil the objectives outlined in section 3.3 of the EIS.

C3.2.1 Project need and justification

Submitters raised general concerns and queries as to the justification and need for the WestConnex program of works including the M4-M5 Link. Concerns included:

- The EIS provides an inadequate explanation of the project's justification. It is not clear what the project will achieve and why Sydney needs it
- No feasible alternatives have been developed as part of the strategic justification
- The strategic justification chapter of the EIS does not address some of the high-level critique of the project and underlying assumptions
- There is no need for the project as there is no evidence that personal vehicles are comparable in efficiency to public transport alternatives
- The project is not justified given the area WestConnex is being built in already has high public transport use
- The project is not justified given the new Western Sydney Airport (WSA) will relocate industry and manufacturing jobs away from the existing Sydney Airport area to the western Sydney employment area and southwest Sydney
- The EIS does not address the impact of the proposed WSA at Badgerys Creek. The proposed airport could have significant impacts on project traffic volumes. The omission could change the justification for the project
- Employment trends are shifting towards automation of many industries and growth in knowledge industries. People working in these industries would not spend hours driving to and from employment centres as they would be caught in congestion and would be unable to work while travelling
- The project is a waste of money as the traffic problem is through Victoria Road at Drummoyne
- There is no evidence that economic growth can be assisted by increased motor traffic to the Sydney CBD
- The M4-M5 Link would be used by less than one per cent of Sydney's population, diverting Federal [Australian] Government funds from more worthwhile and effective causes
- Research shows that the construction of roads and tollways creates congestion and WestConnex is no different. Other similar toll road projects have failed. Previous motorway projects in Sydney and abroad have consistently failed to provide the estimated travel time benefits and congestion relief predicted in their business cases

- It is unlikely that there will be sufficient demand to ensure the toll roads are viable. A review of Roads and Maritime traffic surveys have shown minimal traffic growth since 2006, with the advent of autonomous vehicles further diminishing future demand
- Construction of toll roads has shown to induce more traffic, rather than reduce it
- WestConnex is a temporary solution to transport issues in Sydney and is not sustainable in the medium or long-term
- The EIS predicts that despite the construction of WestConnex, which would cost billions of dollars, there would still be severe congestion in Sydney in 2023 and 2033, requiring further traffic studies and road construction after the completion of the project. The short-sighted scheme focuses more on profits for private business than serving the needs of the public in the long term
- The EIS and underlying traffic modelling did not demonstrate the need for the project. Under all traffic scenarios, the project will generate significant additional traffic. The motorway will exceed reasonable operating limits in the peak in less than a decade
- In a city of five million people, there can never be enough road capacity provided to enable everyone to live as far from work as they like, and drive wherever and whenever they like in free flowing traffic
- The demand for private vehicles will diminish as technology evolves with autonomous cars and shared car ownership. The increase of hybrid and electric cars should not be ignored, nor future demographic trends
- WestConnex is creating a legacy of traffic congestion, which will require building more roads to solve the issues it creates
- Other road projects, such as Iron Cove Bridge, have failed to resolve traffic issues. These learnings should be applied to this project
- Motorways are inappropriate for urban places, and should be progressively removed
- The infrastructure will crowd Sydney's limited space, making it uncomfortable to live
- The project money could have been used to benefit other areas including medical, education and social needs
- The EIS claims that the project will serve centres to the north of the Global Economic Corridor when it will not
- The lack of engineering enterprises prepared to make acceptable tenders to build the Rozelle interchange indicates that the proposal for this interchange is misconceived and should be abandoned
- The end of vehicle manufacture in Australia may influence the need for tollways.

Response

A Plan for Growing Sydney (NSW Government 2014) indicates that from 2011 to 2031, Sydney's population is forecast to increase from 4.3 to 5.9 million, which equates to an average of 80,000 additional residents per year. Moreover, by 2036, the number of trips made around Sydney each day is forecast to increase by 31 per cent from 16 to 21 million vehicle movements.

The WestConnex program of works is part of an integrated transport solution to the increasing pressure on Sydney's road network. The WestConnex program of works, including the project, would facilitate improved connections between western Sydney and Sydney Airport and Port Botany (via the St Peters interchange), as well as better connectivity between key employment hubs and local communities. The need for the WestConnex program of works, including the project, is identified in national and state planning and policy documents (see **section C3.1.1**) as it would help deliver the transport connectivity required to meet future urban growth expectations as part of the transformation of Greater Sydney. The Australian Government is contributing around $3.5 billion to the development of the M4-M5 Link, which was identified as a 'high priority initiative' in the 2016 *Australian Infrastructure Plan: The Infrastructure Priority List.* Further information on the funding arrangements for the project are provided in **section C3.3**.

The project, as part of the WestConnex program of works, aims to:

- Reduce future traffic volumes on north-south and east-west road corridors, including City West Link and parts of Victoria Road
- Enhance the benefits achieved by the operation of the M4 East and New M5 projects by reducing traffic volumes on Parramatta Road, Southern Cross Drive, the Princes Highway, King Georges Road and the M5 East Motorway
- Reduce travel times and improve reliability for bus services, business, personal and freight journeys along the Sydney road network
- Improve road safety by reducing traffic congestion on Sydney's arterial roads
- Facilitate opportunities for future urban renewal in precincts adjoining the project, including The Bays Precinct (in accordance with *The Bays Precinct Transformation Plan*), along Parramatta Road east of Haberfield (in accordance with the *Parramatta Road Corridor Urban Transformation Strategy*), and along Victoria Road between Iron Cove Bridge and The Crescent, by reducing surface road traffic on sections of Victoria Road
- Improve community connectivity through new and upgraded active transport links at Rozelle and Lilyfield
- Provide new open space within the Rozelle Rail Yards, the design and landscaping of which would be further developed in consultation with relevant councils, stakeholders and the community to provide beneficial urban design outcomes and local amenity.

Strategic alternatives to the project are described in Chapter 4 (Project development and alternatives) of the EIS with further responses to submissions on alternatives provided in **section C4.5.1**.

The project would provide benefits to a larger area of Sydney than just the area that project infrastructure is located. Further discussion of the cost benefit analysis for the project is provided in **section C3.3.1**. Together with the other components projects of the WestConnex program of works, the project would also facilitate improved connections between western Sydney, Sydney Airport and Port Botany and south and south-western Sydney, as well as better connectivity between local communities and the important economic centres along Sydney's global economic corridor including the Sydney CBD, Parramatta CBD, Sydney Olympic Park, Sydney Airport and Port Botany. Figure 3-1 of the EIS shows the direct relationship between the WestConnex program of works and the global economic corridor including Sydney CBD, Sydney Olympic Park, Parramatta CBD and Norwest Business Park. The EIS does not claim it would serve northern centres within the global economic corridor. While the project does not directly connect to the northern centres within the global economic corridor, the motorway would reduce travel times on key corridors, thereby improving connectivity across the network.

The WestConnex component projects provide vital connections within and between travel demand corridors and would enable the efficient movement of people, goods and services. The current congestion on arterial roads and the missing links in the motorway network impede the efficient flow of traffic to the important economic centres. The WSA EIS (Australian Government Department of Infrastructure and Regional Development and Cities 2016) acknowledges that Sydney Airport would continue to be the most important airport in the Sydney region for the foreseeable future, with overall demand at Sydney Airport expected to continue to grow to 51 million passengers annually by 2030, 72.7 million passengers by 2050 and 85.3 million passengers annually by 2075. At the same time, WSA is forecast to service 10 million passengers annually by 2031, 37 million passengers annually by 2050 and 82 million passengers annually by 2063.

Demand for travel to WSA is being supported by the Western Sydney Infrastructure Plan, a 10 year, $3.6 billion road investment program being coordinated by Roads and Maritime. This includes the construction of the M12 Motorway, which will provide direct access to the WSA as well as connections to the M7 Motorway, and the broader Sydney motorway network. In addition, the Australian and NSW Government, led by the Department of Infrastructure and Regional Development and Cities and Transport for NSW, are undertaking a Scoping Study to determine the rail needs of western Sydney and the WSA. The objectives of the scoping study include determining the rail service needs of western Sydney from the commencement of operations of the WSA, taking into account the ground transport needs of WSA and western Sydney generally.

Furthermore, a train link between the WSA and Parramatta is identified as an initiative for investigation in collaboration with the Australian Government under the *Draft Future Transport Strategy 2056*.

However, while demand for goods and services (and associated job creation) for WSA is expected in the medium to long term, there is currently a growing freight market for Sydney Airport, with freight (including from the industrial and manufacturing sectors) projected to increase from around 600,000 tonnes in 2012 to over one million tonnes per year by 2033 (Sydney Airports Corporation Limited 2014). The project would reduce freight journey times and improve reliability by connecting the M4 and M5 motorway corridors. It would also support the connection with the Sydney Airport and Port Botany precinct via the proposed future Sydney Gateway project and the St Peters interchange, leading to an overall increase in the capacity of the strategic freight network.

While public transport is part of the integrated transport solution for Sydney, it is recognised that not all trips in Sydney can be served by public transport, especially trips to dispersed destinations, or commercial trips requiring the movement of large or heavy goods/materials. A congested road network also affects road-based public transport, increased bus travel times and variable journey time. While the use of public transport is expected to grow based on economic and demographic forecasts with the implementation of key public transport initiatives, most growth in transport demand over the next 20 years will continue to be met by roads. With about 60 per cent of employment dispersed across the Sydney metropolitan area, public transport alone cannot viably serve most of these locations. The EIS does therefore not make any comparison between the efficiency of private vehicle use versus public transport alternatives.

The NSW Government is proposing to deliver a range of transport infrastructure projects including road, public transport and active transport projects to address the transport challenges associated with a growing Sydney and to provide a range of transport alternatives to support the variety of trips being made across the city.

While the development of the project would have unavoidable impacts (associated with, for example, property acquisition, construction impacts from heavy vehicle traffic, noise, vibration and dust, access disruptions and visual impacts) and in some areas, reduced road capacity and travel times, overall, the project would deliver a large number of benefits. The project has planned to avoid and minimise traffic and transport impacts during operation, however there will be some impacts on the road network as discussed in Chapter 8 (Traffic and transport) of the EIS. It is acknowledged that current traffic congestion experienced on Victoria Road through Drummoyne would not be improved by the project. However, the project would provide an alternative option (the Iron Cove Link) for eastbound vehicles along Victoria Road, east of Iron Cove Bridge, bypassing a number of traffic lights up to the intersection with City West Link. It is also not an objective of the project to channel more vehicles into the Sydney CBD. The Rozelle interchange and the Iron Cove Link would provide alternative connections to City West Link and Anzac Bridge for vehicles already planning to access the Sydney CBD. Should the proposed future Western Harbour Tunnel and Beaches Link program of works be approved, this program, together with the project, would form an inner western bypass of the Sydney CBD for vehicles travelling north-south. The project would also reduce traffic on a number of parallel routes across the study area including Parramatta Road, City West Link, Lyons Road, Balmain Road, King Street, Addison Road, Sydenham Road, Stanmore Road and Southern Cross Drive.

Roads and Maritime recognises that motorways impact the function of the urban environment such as access and attractiveness. Most of the project infrastructure would be located below ground to minimise impacts on the environment, community and land use. Where possible, the project has sought to maximise use of government owned land for construction and permanent operational infrastructure in order to minimise potential property acquisition impacts.

The traffic forecasting and modelling undertaken for the project (refer to Appendix H (Technical working paper: Traffic and transport) of the EIS) includes both strategic and operational modelling based on assumptions that represent the best available information at the time. The model is robust and accounts for foreseeable changes to population and employment. The model and outcomes have been reviewed by independent technical specialists, Roads and Maritime subject matter experts and will also be peer reviewed by DP&E. The modelling approach is generally consistent with the approach undertaken for recent major road and motorway projects in Sydney such as NorthConnex, M4 Widening, M4 East and New M5. The traffic model includes an allowance for induced demand which equates to around 0.3 per cent additional daily trips in the Sydney metropolitan area in 2033 (refer to section 4.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS).

A review of traffic survey data from 2011 to 2017 (available on the Roads and Maritime website[3]) for select roads in the traffic study area indicates that while some roads show above average growth and others show little growth in traffic volumes, it cannot be said that there has been a general decrease in traffic over the last few years. The traffic assessment predicts that without the M4-M5 Link, road network performance in and around Haberfield, Rozelle and St Peters, would deteriorate over time due to forecast traffic growth resulting in congestion along key corridors and intersections. Key benefits forecast for the Sydney metropolitan road network as a result of the M4-M5 Link project are described in **section C8.14.1**.

The operational traffic modelling results indicate that the motorway is forecast to operate at a good level of service in both 2023 and 2033 (Level of service (LoS) C or D in 2033 which is an acceptable level of service) and average traffic speeds are predicted to be 75-80 kilometres per hour and with traffic maintaining average speeds of 77-80 kilometres per hour (refer to section 10.2.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS). The project provides additional capacity to accommodate forecast growth in traffic across the metro area and will improve the overall performance of the road network in terms of time travelled and average speeds. Forecast changes in vehicle kilometres travelled (VKT), vehicle hours travelled (VHT) and average speed on the surface road network show that apart from the Bayside Local Government Area (LGA), other LGAs in the traffic study area will experience improved conditions or no forecast change in terms of daily travel distance, time and average speed (refer to section 10.1.1 and 10.1.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS).

The EIS acknowledges there are increases in traffic predicted in certain locations across the road network including on Anzac Bridge and Victoria Road at Drummoyne. The submitters comments on how lessons learnt from the Iron Cove Bridge duplication have been considered. Increasing the capacity of the bridge was not expected to resolve congestion on Victoria Road as the main constraint is the capacity at the Victoria Road/Darling Street intersection, which causes delays during peak travel hours. The Iron Cove Link is forecast to reduce demand at the Victoria Road/Darling Street intersection in the PM peak in 2023 and 2033 (refer to Table 10-19 of Appendix H (Technical working paper: Traffic and transport) of the EIS).

The EIS also acknowledges that additional upgrades due to the project may be required on the road network following completion of the project. An operational Road Network Performance Review would be undertaken at both 12 months and five years after the commencement of operation of the M4-M5 Link to confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections in proximity to the Wattle Street interchange, Rozelle interchange and St Peters interchange. Operational changes or additional mitigation measures would then be put in place, if required, to address the outcomes of the review. Roads and Maritime is developing a strategy to ensure network integration around the Wattle Street, Rozelle and St Peters interchanges to address key congestion points that would not be improved by the project (such as at Anzac Bridge and Johnston Street). In addition, other proposed projects such as the Sydney Gateway would provide further surface upgrades if it is approved.

Traffic and transport impacts on roads within the Sydney city centre are described in **section B10.8.6**. Due to the small forecast change in the Sydney CBD with the project and the complexity of the Sydney CBD traffic operations, it was not considered appropriate to model the operation of intersections and streets in Sydney's city centre.

Changes to commuter behaviour resulting from structural adjustments to the way people work and move around Sydney would play an important role in determining future land use patterns. This includes changes in demand for private motor vehicle ownership, flexible workplaces with more people working remotely and/or from home, the growth of the sharing economy including ride-sharing and car-sharing services, improved active and public transport, and improvements to technology, including automated (driverless) and fast internet services. These initiatives and their effect on shaping the city of the future, are described in the *Draft Towards our Greater Sydney 2056*, the amendment to *A Plan for Growing Sydney.* The *Draft Towards our Greater Sydney 2056* is supported by the *Draft Future Transport Strategy 2056*, which identifies changes to mobility services over the longer term.

[3] http://www.rms.nsw.gov.au/about/corporate-publications/statistics/traffic-volumes/aadt-map/index.html#/?z=6

Irrespective of the timing and magnitude of these trends there is still a need to provide for the growth in commercial and freight travel demand and to reduce congestion across the Sydney road network. The project would provide the road connections for the future range of vehicles, and in particular reduce through traffic on local surface roads by providing efficient alternative routes through the underground tunnel network.

Future trends in transport, such as ride sharing and autonomous vehicles were considered in the EIS (refer to section 3.2.5 of the EIS). Further responses related to connected and autonomous vehicles and the use of electric cars is provided in **section C31.2.1**.

The EIS does not claim that the project, as part of the WestConnex program of works, would address all of Sydney's congestion problems or resolve all areas of congestion on the road network within the traffic assessment study area. What the WestConnex motorway would do is provide a viable alternative underground route, primarily for freight and commercial vehicles, thereby improving traffic conditions on the surface road network over the short to medium term. Ongoing network improvement strategies, other key motorway connections, public transport projects and active transport projects, would be required to address the pressures of Sydney's growing population.

Decisions regarding the location of vehicle manufacturing are the responsibility of the car manufacturing industry and are influenced by macro-economic government policy, which is unlikely to influence traffic demands. Cars will continue to be imported from overseas and sold locally.

C3.2.2 The project is inconsistent with community needs

Submitters raised concerns that the justification for the WestConnex program of works is inconsistent with community needs and generally does not have community support. Particular concerns raised include:

- The interest of private organisations and toll companies are being put before other public needs such as public transport, schools and hospitals. Private vehicle infrastructure is being prioritised over community health and safety, specifically for the community of Leichhardt
- The project is not in the public interest. The project forces the least desirable option for each community, creates division and renders harm with unfair acquisitions, while costing billions of dollars
- Public interest in efficient transport, reduced vehicle emissions and reduced traffic, have not been taken into account. The project has become a political issue, with no regard to the best interests of the public
- The project was not developed in the best interests of the people of western Sydney as they do not want to drive into central Sydney for jobs
- Motorways like WestConnex will disadvantage Sydney's urban areas as no one wants to build medium density housing next to a motorway. Public transport on the other hand naturally attracts development and all the economic benefits that go with it
- Experience from previous toll roads shows that urban renewal along major corridors will not occur. Examples include Canterbury Road in relation to the M5 East and the Cumberland Highway in relation to the M7 Motorway
- The EIS fails to meet local community needs
- The EIS fails to meet the needs of the students at Rozelle Public School
- Building more tollways creates an intolerable economic, social, health and reduced amenity burden on the people of Sydney and NSW more generally.

Response

The NSW Government budget for 2016-2017 provides funding across the full range of government responsibilities including allocations for road and freight infrastructure projects, public transport initiatives, and the health and education sectors. WestConnex will be financed through user tolling in the long term, supported by short to medium term investment by both government and the private sector. A non-recourse debt model will be used to raise private finance while protecting the NSW Government's credit rating metrics. Further information on project funding is provided in **section C3.3**.

As the NSW Budget makes clear, infrastructure investment must address the State's infrastructure requirements while allowing government to sustainably manage debt. Investment decisions need to avoid pressure on the State's balance sheet and credit rating. Solutions to the growing infrastructure deficit need to be able to work within the financial constraints of the NSW Budget. This is particularly important for the government in maintaining the State's AAA credit rating, which directly impacts the State's ability to fund future investments.

Section 7.2 of the EIS provides an overview of how feedback from stakeholders and the community has influenced the design outcomes of the project. An overview of design changes and commitments in response to community feedback is also provided online on the WestConnex website[4]. The project has been designed to address the needs of the local community while meeting the project objectives related to the wider Sydney metropolitan area. Comments received during public exhibition of the EIS have resulted in design changes proposed in the Preferred infrastructure report (refer to **Part D** (Preferred infrastructure report)) and in the update to a number of proposed environmental management measures (see **Chapter E1** (Environmental management measures)).

One of the objectives of the project is to improve connectivity and enhance social cohesion within the local community, particularly between Rozelle, Lilyfield, Annandale and Leichhardt. To achieve this objective, the project has been designed to be located underground and government owned land has been used where possible to minimise property acquisition. The project would also deliver improved active transport links to connect communities at Rozelle/Lilyfield and Annandale.

The acquisition of private property has been minimised as far as possible. This is discussed further in Chapter 12 (Land use and property) of the EIS. All property acquisition for the project will be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW) and the land acquisition reforms announced by the NSW Government in 2016 (NSW Government 2016b), which can be viewed online at the NSW Department of Finance, Services and Innovation website[5].

The project, as part of the WestConnex program of works, is part of an integrated transport solution for Sydney, which includes the development of new public transport initiatives. Opportunities to integrate the project with future public transport improvements (such as Sydney Metro West and public transport improvements along the Parramatta Road and Victoria Road corridors) will continue to be investigated throughout the detailed design phase, in consultation with relevant government agencies and local councils. The project therefore does not preclude the development of public transport in the local community.

The project involves redirecting surface traffic into tunnels. This would contribute to the reduction of vehicle emissions at the surface compared to the existing condition. By venting the vehicle emissions from the tunnels at heights that facilitate improved dispersion, the ambient air quality in the project footprint is expected to improve (refer to Chapter 9 (Air quality) of the EIS).

The M4-M5 Link EIS demonstrates that, on balance, the project is in the public interest and would have a number of beneficial outcomes, in addition to the economic benefits for NSW such as job creation and economic stimulus during construction and improved overall road network performance, reduced travel times and improved freight efficiency during operation (refer to Appendix P (Technical working paper: Social and economic) of the EIS). The project would result in an overall major positive impact at a local and regional scale due to an enhanced network capacity and connectivity, which would benefit future generations. Western Sydney communities would benefit from faster travel times to the Sydney CBD and to Sydney Airport. The motorway would also provide improved connectivity for traffic from central, inner west and southwest Sydney travelling to destinations within western Sydney such as Sydney Olympic Park, Parramatta and the proposed WSA.

The project would improve general amenity by reducing the volume of traffic on surface roads, which would be displaced into the tunnels. This would subsequently reduce current levels of noise and vibration, air pollution from vehicle emissions, traffic movements and congestion in local neighbourhoods, thereby reducing impacts on community facilities such as schools. The project would contribute to improved liveability in local communities and play a key role in facilitating social inclusion, by providing better access to employment locations and connecting people to social and cultural hubs.

[4] https://www.westconnex.com.au/sites/default/files/Response%20to%20community%20feedback%20factsheet_FA_digital.pdf
[5] https://www.finance.nsw.gov.au/sites/default/files/NSW_Government_Response.pdf

For the area around Rozelle Public School, the project would:

- Reduce traffic on this section of Victoria Road and as a result improve the performance of nearby intersections (eg intersections of Victoria Road/Darling Street and Victoria Road/Wellington Street will be maintained or improved for the project)
- Reduce traffic noise and air quality impacts from surface road traffic along this section of Victoria Road.

It is also important to note that the Iron Cove Link ventilation outlet was predicted not to result in significant changes to air quality at Rozelle Public School (see **section C9.11.3**). There would also be no change to the existing active transport links in the vicinity of the school apart from an upgrade of the existing link along the south side of Victoria Road (between Byrnes Street and Springside Street).

Road tunnel usage in urban areas would result in a long-term reduction in greenhouse gas (GHG) emissions, where travel along a more direct route at higher average speeds results in fewer vehicle emissions being generated by road users. The project would result in reduced congestion and stop-start driving which would improve vehicle fuel efficiency (refer to Chapter 22 (Greenhouse gas) of the EIS). Despite increases to overall daily VKT on motorways, population growth and a reduction in performance of some non-motorway roads, a reduction in GHG emissions is estimated as a result of the project.

In addition, the project provides for:

- Creation of open space at the Rozelle Rail Yards for community and recreational use
- New and improved active transport links at Rozelle (north-south and east-west), connecting currently disconnected communities and improving community cohesion
- Opportunities for future urban revitalisation and public transport improvements along existing arterial roads, particularly along Victoria Road at Rozelle and Parramatta Road, east of Haberfield, as a result of reductions in surface traffic volumes.

The NSW Government is focused on integrating land use planning with key transport projects such as WestConnex as evidenced by strategic documents such as the *Parramatta Road Corridor Urban Transformation Strategy* and *The Bays Precinct Transformation Plan*.

Major components of project infrastructure are located in tunnels below ground, reducing surface impacts and maximising land available for future development according to strategic land use planning.

C3.2.3 Project discourages investment in and use of public transport

Submitters raised concerns that the project discourages the use of public transport and investment in public transport infrastructure. In particular submitters raised the following issues:

- Public transport options were not properly explored prior to the development of WestConnex
- The project discourages investment in public transport, such as the proposed rapid transit system for Parramatta. A lack of investment in public transport may cause people who are unable to drive to lose independence
- The project is inconsistent with the overall public transport strategy and ignores long-term trends of increasing public transport utilisation in Sydney, particularly along the main route of the M4-M5 Link
- The project is an unfair way to prepare the city for the future. Many countries are demolishing toll roads and installing public transport, making for a better quality of life for their citizens. Previous light rail investments mean more people are travelling to work via this mode of transport
- The project is not part of an integrated solution with public transport and the need for the project should be reconsidered given the government's commitment to Sydney Metro West
- Most people in Emu Plains, Mt Druitt, Penrith and Blacktown who work in the Sydney CBD use trains with 90 per cent of communities in western Sydney preferring to use trains rather than drive to the Sydney CBD
- The project provides little opportunity to modify surface roads for dedicated bus lanes

- The project reduces the availability of funds for public transport projects, which could reduce congestion and give priority for high productivity road users such as delivery and service vehicles
- The project area has more public transport potential than the Greater Metropolitan Area, as noted in the EIS
- There may be possible impediments to future improvements in public transport if the operators of the tolled motorways are given non-competition clauses in their contracts.

Response

The *Transport Master Plan*, *State Infrastructure Strategy* and *Updated State Infrastructure Strategy*, together with the more recent *Draft Future Transport Strategy 2056*, are NSW Government planning and policy documents which outline the transport infrastructure needs of the Greater Sydney region. These documents establish a policy direction that supports the provision of integrated transport solutions which consider the need for expanding the road network, providing more public transport services and improving active transport connectivity.

In assessing the need for new road infrastructure, the *State Infrastructure Strategy* found that public transport was the best option for journeys to dense employment centres (such as the Sydney CBD and Parramatta), where public transport is already the preferred choice for many employees. However, the dispersed nature of the majority of Sydney's journeys means that the flexibility provided by the private car makes it the dominant choice. This demand pattern is the consequence of established land use patterns in Sydney and there is no indication in the available data that the patterns of demand would change in the future.

The *State Infrastructure Strategy* also found that private road transport is, and would remain, the only viable option for most journeys in Sydney most of the time, even with the targeted growth in public transport and rail freight sought by the NSW Government, and the expected increase in the population density of the city. The NSW Government has therefore committed to upgrading the road and motorway network to cater for private vehicles, freight and on-road public transport. With this in mind, the government is making substantial investment in strategically important public transport, including Sydney Metro City and Southwest, CBD and South East Light Rail, Parramatta Light Rail Stage 1, enhancements to the suburban rail network, bus improvement programs and upgrades to cyclist and pedestrian facilities. In addition, a number of other initiatives are in the early planning stages including Sydney Metro West and Parramatta Light Rail Stage 2.

Public transport as a strategic alternative to the project is discussed in section 4.4.2 of the EIS. While the use of public transport is expected to grow with the implementation of key public transport initiatives, most growth in transport demand over the next 20 years will continue to be met by roads.

Public transport is best suited to providing concentrated, high volume flows of people to and from established centres. It is less suited to providing dispersed cross-city or local trips. In 2014, around 17.6 million trips were made each average weekday in Sydney, with around 75 per cent of these by road. Even with significant investment and high levels of patronage growth forecast for Sydney's public transport network, about 72 per cent of around 27.5 million journeys in 2031 are expected to be made on the road network each weekday by private vehicles, equal to an additional 4.3 million new trips compared to 2014 (Infrastructure NSW 2014).

The key customer markets identified for the project include highly dispersed and long distance passenger movements, as well as heavy and light freight and commercial services and businesses whose travel patterns are also highly dispersed and diverse in nature. These customers have highly varied requirements when it comes to the transfer of goods and services. These requirements include the transport of containerised freight by rigid and articulated trucks, light trucks, vans, utility vehicles and cars. Public transport would only partially address these customer demands. No feasible strategic transport alternatives such as heavy or light rail options or bus corridor enhancements would meet the diverse range of customer needs for travel in this corridor and address the project objectives as effectively as the project and the broader WestConnex program of works.

While the public transport system supports a significant number of commuters travelling to and from Sydney's major centres, around 70 per cent of all commuters across metropolitan Sydney travel by car. According to the Bureau of Transport Statistics' September 2014 Release Employment Forecasts (Bureau of Transport Statistics 2014), 60 per cent of jobs are outside of Sydney's major centres. Given the diffuse nature of employment and the diverse purposes of many trips, public transport is not able to provide a convenient alternative for a large proportion of travellers.

As described in section 3.1.5 of the EIS, the WestConnex program of works has considered the vision outlined in various public transport strategies, including *Sydney's Rail Future* (Transport for NSW 2012b), *Sydney's Light Rail Future* (Transport for NSW 2012c) and *Sydney's Bus Future* (Transport for NSW 2013a). The design of the M4-M5 Link has considered proposed public transport projects such as Sydney Metro West, public transport improvements along Parramatta Road between Burwood and the Sydney CBD and public transport improvement projects along Victoria Road. By reducing traffic on Victoria Road, there is an opportunity to improve public transport services along this corridor which may connect with a future metro rail station located within The Bays Precinct. The new east-west and north-south active transport connections created by the project at Rozelle would also provide improved connectivity to a future metro rail station located within The Bays Precinct.

Opportunities to integrate the project with future public transport projects will continue to be investigated throughout the detailed design phase, in consultation with relevant government agencies and other key stakeholders including UrbanGrowth NSW and Transport for NSW. The project therefore does not preclude the development of public transport within the project footprint or in the vicinity.

In response to the submitter concern about operation of the motorway, it should be noted that contractual arrangements with the operator of the motorway are outside the scope of the EIS.

C3.2.4 Benefits would be limited and outweighed by costs

Submitters raised concerns that the benefits of the project are limited and that the costs outweigh the benefits. Specific issues include:

- Global experience of major toll road construction has demonstrated conclusively that these projects are expensive and counter-productive
- The project does not provide value for money. The value of time saved would be less than the cost of using WestConnex
- The project would negatively impact bus efficiency via Iron Cove tunnel [the Iron Cove Link] and Anzac Bridge, and improve efficiency on Parramatta Road. This result could be achieved with bus lane extensions, negating the need for the project
- The benefits of the M4-M5 Link in the *WestConnex Updated Strategic Business Case* includes other tollways such as the Sydney Gateway, suggesting that the project would not present benefits as a standalone project
- Travel times would not improve significantly enough to warrant the financial, social, environmental and infrastructural impacts to various areas and communities
- Cost/benefits are not sufficient to warrant the uncertainty of revenue returns and travel time improvements
- The jobs created as a justification for the project are largely temporary. Few permanent jobs, and infrastructure which becomes rapidly redundant, is not a permanent solution and provides little benefit
- The project is a waste of taxpayers' money, in which there is no return to the public for their vast public investment
- The time saved by commuters using WestConnex will be outweighed by the increased congestion experienced by residents making short trips in the inner west The benefits of the project are overestimated and the costs underestimated
- The areas that would become less congested, such as Victoria Road, have limited redevelopment potential and are not considered a priority by the NSW Government
- Western Sydney residents would not get direct benefit from the project due to increasing tolls over the next 40 years
- The EIS lacks evidence around project benefits.

Response

Road congestion costs NSW around $5 billion each year, largely due to time delays. This figure is expected to increase to $8.8 billion each year by 2020 (Transport for NSW 2012a). Without major investment in road network infrastructure increasing population growth in the Sydney metropolitan area (see **section C3.2.1**) would result in worsening road congestion. This congestion would in turn affect Sydney's economic competitiveness as a global city.

The M4-M5 Link would improve the capacity of the NSW motorway network and would support connections to Sydney Airport and Port Botany, assisting with growth in air travel and freight movements. The project would provide improved motorway access and efficiency within the local area by:

- Providing a new motorway link between the M4 East at Haberfield and the New M5 at St Peters
- Reducing future traffic volumes on north-south and east-west road corridors, including City West Link and parts of Victoria Road and Parramatta Road, which would facilitate potential public transport improvements
- Enhancing the benefits achieved by the operation of the M4 East and New M5 projects by reducing traffic volumes on Parramatta Road, Southern Cross Drive, King Georges Road and the M5 East Motorway
- Reducing travel times on surface roads would improve reliability for bus services
- Facilitating enhanced connectivity between the western suburbs and Sydney Airport and Port Botany, and providing links to population and employment growth centres in Parramatta and western Sydney in conjunction with other WestConnex projects including (for the 2033 'with project' scenario)
  - Between Parramatta and Sydney Airport, average peak period travel times are forecast to reduce by about 10 minutes. This saving is part of a 30 minute saving comparing the 2033 'with project' scenario to a scenario without WestConnex
  - Between Burwood and Sydney Airport, average peak period travel times are forecast to reduce by about five minutes. This saving is part of a 20 minute saving comparing the 2033 'with project' scenario to a scenario without WestConnex
  - Between Silverwater and Port Botany, average peak period travel times are forecast to reduce by about 10 minutes. This saving is part of a 20 minute saving comparing the 2033 'with project' scenario to a scenario without WestConnex.
- Facilitating future growth in Sydney's transport network by allowing for connections to the proposed future Western Harbour Tunnel and Beaches Link program of works and to the proposed future Sydney Gateway via the St Peters interchange.

Motorists in the Inner West LGA would experience around a 11-12 per cent reduction in daily VKT, a 20 to 21 per cent reduction in daily VHT and a 10 to 14 per cent improvement in daily average speeds on non-motorway links (refer to Table 10-2 and Table 10-4 of Appendix H (Technical working paper: Traffic and transport) of the EIS).

It is acknowledged that the development of the project would have unavoidable impacts (associated with, for example, property acquisition, construction impacts from heavy vehicle traffic, noise, vibration and dust, access disruptions and visual impacts) and in some areas, reduced road capacity and travel times, which would be managed by robust environmental management measures for the project (see **Chapter E1** (Environmental management measures)). However, overall the project would deliver a large number of benefits as described below.

As discussed in section 3.4 of the EIS, the project would deliver the following key benefits and opportunities:

- Reduce travel times and improve reliability for bus services, business, personal and freight journeys along the Sydney road network
- Improve road safety by reducing traffic congestion on Sydney's arterial roads
- Ease congestion on surface roads by providing an underground motorway alternative and allowing for increased use of surface roads by pedestrians and cyclists and for public transport

- Reduce through traffic on surface roads thereby facilitating urban renewal opportunities to be realised along parts of the Parramatta Road and Victoria Road corridors
- Reduce traffic pressure on other key north-south links including the Princes Highway/King Street, Southern Cross Drive, and the A3 and A6 corridors
- Deliver up to 10 hectares of new open space at the Rozelle Rail Yards which would provide an open space link between Bicentennial Park at Glebe and Easton Park at Rozelle
- Deliver new north-south and east-west pedestrian and cycleway connections to link Rozelle and Lilyfield with Annandale, Balmain, Glebe and The Bays Precinct.

By enabling connections to the proposed future Western Harbour Tunnel project and Sydney Gateway project, the M4-M5 Link would allow for potential further benefits to be realised, such as improved connectivity with the Sydney Airport/Port Botany precinct and forming part of an inner western bypass of the Sydney CBD. The long term benefits of the project would deliver value for money to the communities of the Sydney metropolitan area.

NSW Government planning and policy documents do not identify Victoria Road as a priority for urban renewal, however, due to the extent of changes that would be brought about by the project, creating opportunities for urban renewal along Victoria Road would be of benefit to the local community. Public transport improvements along Victoria Road has been identified as a key element for consideration in the next 20 years in the *Revised Draft Eastern City District Plan* (Greater Sydney Commission 2017). Victoria Road east of Iron Cove Bridge is also identified as a strategic bus corridor in *Draft Future Transport Strategy 2056*. By reducing traffic congestion on parts of Victoria Road, the project would facilitate future public transport improvements in the area. The project would also reduce congestion on Parramatta Road and this corridor is identified as a priority for urban development by the NSW Government in the *Parramatta Road Corridor Urban Transformation Strategy*.

A discussion of the project costs and benefits including the economic analysis behind the project benefit cost ratio (BCR) are discussed in **section C3.3.3**. For the M4-M5 Link project, the BCR has been calculated as $2.38 or $2.94 with wider economic benefits. These ratios indicate an economically viable proposal. The investment in the WestConnex program of works would facilitate improvements across the network and generate more than $20 billion worth of benefits to the Australian economy.

Tolls would escalate up to a maximum of four per cent or the consumer price index (CPI) per year (whichever is greater) until 2040 (which is 17 years after project opening). After that, CPI would apply. The WestConnex program of works would provide a significant travel time saving and reduced operating costs for western Sydney motorists travelling to Sydney Airport or to the Sydney CBD. However, use of the motorway is a personal choice with individuals having to weigh up the travel time savings against the cost of the tolls. Free alternative routes would remain available. Further discussion on tolling is included in **section C3.5**.

In November 2017, the NSW Premier announced a vehicle registration cashback scheme for motorists who spend more than $25 a week on tolls in NSW to claim free vehicle registration. The scheme (as announced) will be available for standard privately registered cars, utes, four-wheel-drives and motorcycles from 1 July 2018 and be backdated to July 2017. The scheme will not include trucks or other vehicles weighing more than 2,795 kilograms. This is expected to save the majority of motorists who apply to the scheme around $358 a year on registration costs, and some up to $715 a year.

The WestConnex program of works, including the project, does not claim to resolve all of Sydney's road congestion issues but it will make a significant contribution to improving road capacity and the efficiency and safety of travel between key centres within the Sydney metropolitan area, the benefits of which are described above. WestConnex, as well as other related road projects and a number of public transport projects have been identified by the NSW Government as being critical infrastructure necessary to cater for Sydney's growth and development.

C3.2.5 WestConnex and the M4-M5 Link are an outdated planning solution and will not meet Sydney's transport requirements

Submitters raised concerns that construction of WestConnex is an outdated urban planning solution to Sydney's traffic problems. In particular submitters raised the following concerns:

- WestConnex is the wrong answer to a problem which demands a fundamental rethink of how we live in cities. Building more road infrastructure is an outdated response to the city's issues. Road infrastructure restricts the growth of liveable, clean places and negatively impacts future generations. These decisions on urban planning issues are based on old and outdated models

- Other cities are working on liveability and amenity instead of building more freeways. WestConnex is outdated and would lead to a significant deterioration in the quality of this city
- Increasing population density and relying on private road transport is fundamentally at odds with each other
- The project is inconsistent with current trends in thinking about public transport, urban planning and liveability of cities
- Pursuing this project is outdated as car use is decreasing
- The project is one of the worst examples of bad city planning and will not provide the right solution to population growth projections for Sydney
- The 'Downs-Thomson Paradox' is a well-known and researched theory in transport policy in which the construction of motorways and toll roads will encourage more cars and ultimately increase congestion.

Response

Draft land use and future transport planning and policy documents for NSW (the *Draft Future Transport Strategy 2056* and the *Draft Towards our Greater Sydney 2056*) outline a vision for Sydney that has reduced private car ownership, improved public transport patronage and the uptake of new technologies such as connected and autonomous vehicles. While these policy documents support reduced car ownership and improved public transport, they also recognise the important role that the strategic road network (including motorways) plays in supporting cross city movements by freight - trips best served by car and on-road public transport. The policy documents identify WestConnex as a committed initiative to be delivered in the short term.

While the WestConnex program of works complements this future vision of a more liveable, sustainable and growing Sydney by providing improved connectivity between the 'three cities' (ie the Sydney CBD, Parramatta and Western Sydney Airport-Badgerys Creek) envisioned in the plan, its focus is to address current road network issues across the inner west and western Sydney.

As described in the *WestConnex Updated Strategic Business Case,* while Sydney has an extensive and growing public transport system, consisting of buses, heavy and light rail and ferry services, around 70 per cent of all commuters across metropolitan Sydney travel by car. Public transport alone is therefore unable to provide a convenient alternative for a large proportion of travellers given the diffuse nature of employment centres and the diverse purposes of many trips.

The M4-M5 Link, as part of the WestConnex program of works, supports a coordinated approach to the management of freight and passenger movements, and is complementary to all modes of transport including road, rail, bus, ferries, light rail, cycling and walking.

As explained in the EIS, while the NSW Government is investing $41.5 billion (2016–2017 NSW Budget) in transport projects over the next four years (including roads and public transport), there are no feasible strategic public transport or freight alternatives to the project that, on their own, would meet the diverse range of needs for travel in the Sydney metropolitan area. The M4-M5 Link would provide a significant improvement to Sydney's traffic network and provide capacity for the future. The additional network capacity provided by the project would assist in accommodating the forecast growth in population and travel demand that would otherwise contribute to worsening road network and traffic conditions without the project. A congested road network also affects road-based public transport, resulting in increased bus travel times and journey time variability.

The 'Downs-Thomson Paradox' states that improvements to the road network can increase congestion where the improvements make it harder to access public transport or where road network improvements cause disinvestment in public transport. It is considered that an appropriate level of integration with public transport has been provided for by the project (refer to section 5.6.8 of the EIS). Without the project, forecast changes in traffic volumes on roads (that are also key bus corridors) would impact on the reliability and the trip times of on-road public transport. Reduced traffic volumes on key bus corridors would improve public transport journey times and reliability. The NSW Government is continuing to make substantial investment in strategically important public transport.

The WSA at Badgerys Creek has been considered in the assessment of traffic and transport impacts from the M4-M5 Link as it is included in the land use and employment projections assumed in the traffic model. The WSA EIS (Department of Infrastructure and Regional Development and Cities 2016) acknowledges that Sydney Airport would continue to be the most important airport in the Sydney region for the foreseeable future, with overall demand at Sydney Airport expected to continue to grow to 51 million passengers annually by 2030, 72.7 million passengers annually by 2050 and 85.3 million passengers annually by 2075. At the same time, WSA is forecast to service 10 million passengers annually by 2031, 37 million passengers annually by 2050 and 82 million passengers annually by 2063. See **section C3.2.1** for further detail.

C3.2.6 Reliance on other WestConnex component projects and other related projects

Submitters raised concern regarding the project's reliance on other WestConnex component projects and other related projects to meet its objectives. Specific concerns are listed below:

- Concern that the viability of the project is dependent on more tollways being constructed that are not part of the WestConnex program of works and that these projects may not go ahead
- Concern that the project relies on other future projects which have not been approved or funded and may not be built, such as the F6 Southern motorway [the F6 Extension], Western Harbour Tunnel and Beaches Link and Sydney Gateway
- The Western Harbour Tunnel project will act to mitigate the impacts from the M4-M5 Link. This exposes the fallacy of constructing additional motorways to 'solve' congestion
- The 'Do something (2033)' scenario stated in the EIS depends on an unplanned harbour crossing [the Western Harbour Tunnel project]
- Improvements to freight services rely on the Sydney Gateway project.

Response

The M4-M5 Link is part of the WestConnex program of works. Its purpose is to link other key component projects to form the WestConnex Motorway. The project objectives are consistent with the broader objectives of the WestConnex program of works, which have been developed to be aligned with the strategic objectives of national and NSW planning and policy documents. The project is a critical motorway link that contributes (together with the M4 East and New M5 projects) to connecting western Sydney's population and growth centres with employment and business opportunities in the Sydney CBD and the Sydney Airport and the Port Botany precinct, through a direct connection to the proposed future Sydney Gateway project at St Peters.

However, one of the project objectives is to enable long-term motorway network development by providing a connection to the proposed future Western Harbour Tunnel and Beaches Link program of works to the north (refer to section 3.3 of the EIS). Therefore, in addition to linking to other WestConnex projects, the M4-M5 Link is designed to allow for connections to the proposed future Western Harbour Tunnel and Beaches Link program of works, the Sydney Gateway (via the St Peters interchange) and the F6 Extension (via the New M5) projects, should they be approved.

While these related projects have been considered in the cumulative impact assessment for the M4-M5 Link, summarised in Chapter 26 (Cumulative impacts) of the EIS, the M4-M5 Link is not dependent on any of these projects proceeding and is feasible without them. In 2033, the EIS assesses a project only scenario which includes all WestConnex projects but not the proposed future Western Harbour Tunnel and Beaches Link, Sydney Gateway or F6 Extension projects. The EIS also assesses a 2033 cumulative scenario which includes the projects described above (refer section 4.2.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS).

The importance of the M4-M5 Link in achieving all of the broader WestConnex strategic objectives is recognised in the EIS (refer to section 3.3 of the EIS). This is reflected in the traffic impact assessment carried out for the project (refer to Appendix H (Technical working paper: Traffic and transport) of the EIS), which identified that additional road network augmentation would be required to achieve the full benefits of WestConnex.

The proposed future Western Harbour Tunnel and Beaches Link program of works, the Sydney Gateway (via the St Peters interchange) and the F6 Extension (via the New M5) projects, are not part of the M4-M5 Link project and are beyond the scope of the EIS. An assessment of the travel time impacts as a result of the respective projects is expected to be included in the traffic and transport assessments undertaken as part of the EISs for those projects.

The mitigation measures proposed for the project (including the measures proposed in **Chapter E1** (Environmental management measures)) relates solely to the project. The project does not rely on the proposed future Western Harbour Tunnel project for mitigation.

C3.2.7 EIS and business case do not consider future transport trends

Submitters raised concerns that the EIS and WestConnex business case do not consider the following transport trends and changes to work travel patterns which may limit the benefits and longevity of the WestConnex program of works:

- The assumption that congestion will continue to worsen as the population will increase is doubtful
- The EIS does not outline factors including population and employment growth, and changes to demand corridors, putting in doubt the strategic rationale for the project
- The increased preference for high density living close to places of work
- Changing work patterns over the next decade, supported by technologies such as teleworking and flexible office spaces, which would see fewer commuters and more neighbourhood based work hubs
- Workers electing to work closer to home or use public transport, bicycles or car sharing. Changes to personal transport over the next 30 years will likely mean that people will not be owning or driving their own cars
- Increasing online communication, through the National Broadband Network (NBN), reducing the need to commute
- The rise of ride-share services such as Uber and GoGet
- Electric vehicles replacing internal combustion engine cars and driverless cars
- Decreasing global supply of fuel which would limit use of the WestConnex program of works to 15 to 20 years - the public expectation is that WestConnex would return 80 to 100 years of use
- WestConnex is not a solution in view of peak oil and the greenhouse effect which may see walking, cycling and public transport be the preferred travel option over building more freeways.

Response

Sydney's population is expected to increase by more than 1.6 million people by 2031 and without major investment in road network infrastructure in the short to medium term, this growth is expected to result in worsening road congestion. This congestion would in turn affect Sydney's economic competitiveness as a global city. In preparing the *Transport Master Plan*, transport infrastructure and service options were considered to identify an appropriate mix of initiatives to respond to Sydney's transport needs and to deliver an integrated transport and land use planning outcome.

The traffic assessment for the M4-M5 Link project used the WRTM v2.3 which is based on land use, population and employment forecasts provided by DP&E. This data includes allowance for growth from a number of large scale urban development projects such as those outlined in *The Bays Precinct Transformation Plan* and *Parramatta Road Corridor Urban Transformation Strategy* and the future population trends associated with this planned development. However, technological changes over the next 30 years are likely to influence population and employment trends in ways that cannot be anticipated and so it is difficult to accurately forecast what this will mean for Sydney's transport system.

Changes to commuter behaviour resulting from structural adjustments to the way people work and move around Sydney would play an important role in determining future land use patterns. This includes changes in demand for private motor vehicle ownership, flexible workplaces with more people working remotely and/or from home, the growth of the sharing economy including ride-sharing and car-sharing services, improved active and public transport, and improvements to technology, including automated (driverless) and fast internet services. These initiatives and their effect on shaping the city of the future, are described in the *Draft Towards our Greater Sydney 2056*, the amendment to *A Plan for Growing Sydney.* The *Draft Towards our Greater Sydney 2056* is supported by the *Draft Future Transport Strategy 2056*, which identifies changes to mobility services over the longer term. While the future changes associated with these policies are acknowledged, ongoing investment in Sydney's strategic road network and the delivery of WestConnex is still required to address current transport problems.

Connected and autonomous vehicles (CAVs), ride-share and car-share initiatives

Irrespective of the timing and magnitude of the take-up of new technologies such as CAVs, there is still a need to provide for the growth in commercial and freight travel demand and to reduce congestion across the Sydney road network.

All new vehicles are expected to have driverless capability within 10 years. However, because of the varying take-up rates for new technologies, the time taken for fleet turnover and the time needed for mature regulatory frameworks to be developed, there is likely to be a period of around 20 years with a mixed fleet of driverless and human driven vehicles. In this timeframe, Sydney's population will increase from around five million to eight million people, and the need for individual mobility and freight and commercial activity will increase with population growth. The impact of the uptake of CAVs on trip generation is not clear at this time, however CAVs will still rely on road infrastructure.

The growth of car-share schemes such as GoGet and ride-share services such as Uber and Lyft have resulted in reductions of eight to nine per cent in mass transit patronage in the United Kingdom and North America, due to the attraction of affordable on-demand services. Although there would be some saving in road space when vehicles are systems driven (ie connected and automated), as they will travel closer together, this would be offset by the increase in the number of vehicles on the road network and a potential increase in total VKT as a result of the use of automated vehicles by people who currently do not drive and/or who would otherwise use alternative modes of transport.

The project would provide the road connections for the future range of vehicles, and in particular reduce through traffic on local surface roads by providing efficient alternative routes through the underground tunnel network.

The expected future increase in electric vehicle use would not influence the need for the project as electric vehicles travel on the same road network as combustion engine vehicles. However, the proportion of electric vehicles on the road network could have a beneficial impact on GHG emissions and therefore air quality (see to **Chapter C22** (Greenhouse gas)). However, this could not be assessed in any detail in the EIS, as the proportion of electric vehicles that would make up the future vehicle fleet in Sydney is not known.

As described in **section C3.2.1**, Sydney's population is forecast to grow significantly over the next 20 years. The use of private vehicles by this increasing population is not contingent on the WestConnex program of works. With or without the project, the growing population would require transport to locations that are dispersed through the Sydney metropolitan area and not necessarily serviced by public transport. Furthermore, the development of the project does not preclude use of electric vehicles, the ongoing development of public transport or other energy efficient transport options.

In the event that the global supply of fuel is limited in the future, it is reasonable to assume that alternative fuel sources would be used for vehicles (eg electric vehicles).

C3.2.8 The M4-M5 Link is unjustified due to the existing motorways and roads

Submitters queried the need for the project due to existing traffic infrastructure. Specific queries and concerns include:

- The M4-M5 link is unjustified, due to the M7 Motorway, A6 and A3 corridors already linking the M4 and M5 motorways
- Existing motorways, including the Cross City Tunnel and Eastern Distributor, are sufficient infrastructure

- The EIS notes that the M4-M5 Link will complete the 'orbital' road network between western Sydney and the eastern gateways of Port Botany and Sydney Airport. Submitters raised concerns that this orbital network already exists in the form of the M2, M7 and M5 motorways, Eastern Distributor, Sydney Harbour Tunnel, Gore Hill Freeway and Lane Cove Tunnel
- Motorists would choose to use existing routes to go east, into the Sydney CBD or across to Erskineville, with only a small proportion choosing to use a tunnel to Haberfield or Rozelle
- The Rozelle interchange and Iron Cove Link do not meet the project objective of linking the M4 East and New M5 projects and should therefore not be included in the overall WestConnex program of works.

Response

The transport network in Sydney is expected to be put under increasing pressure over the next 20 years. *A Plan for Growing Sydney* indicated that from 2011 to 2031, Sydney's population is forecast to increase from 4.3 to 5.9 million, which equates to an average of 80,000 additional residents per year. Moreover, by 2036, the number of trips made around Sydney each day is forecast to increase by 31 per cent from 16 to 21 million vehicle movements.

Key corridors currently accommodate high levels of daily traffic including freight, commuter and leisure travel. Users of these corridors frequently experience congestion and delay, particularly during weekday and weekend peak periods. This indicates the additional network capacity provided by the project is needed in accommodating the forecast growth in population and travel demand that would otherwise contribute to worsening road network and traffic conditions without the project.

There are currently no existing arterial roads that would directly link the M4 East Motorway at Haberfield with the New M5 Motorway at St Peters, both of which are currently under construction. In the absence of the project, motorists using these motorway tunnels wishing to travel north or south would be required to travel along local and sub-arterial roads or traverse the Sydney CBD to access existing key north-south corridors such as the M1 Motorway.

As a result of the M5 East Motorway currently operating over capacity for long periods of the day, connecting arterial roads such as King Georges Road and the remainder of the A3 corridor, perform a higher-order transport workload than they were originally intended for, particularly for heavy vehicles. Traffic flows on the A3 corridor between the M4 and M5 motorways vary from around 60,000 vehicles per day to nearly 100,000 vehicles per day. The result is increased congestion, travel time variability and a higher risk of traffic breakdowns and collisions.

The A3 corridor between the Hume Highway and the M5 Motorway is bordered by predominantly private residences, with many homes sited close to the road, and with clusters of businesses in some suburbs. Grade separation may result in potential visual impact issues and requires more land than at-grade intersections, which would require the acquisition of businesses and homes around each intersection. There are two grade separated and 17 signalised intersections along the A3 corridor between the M4 and M5 motorways. Heavy congestion on the corridor during peak periods reduced average travel speeds to around 25 kilometres per hour in 2015.

It would not be feasible to grade separate each intersection and therefore stop-start traffic at signalised intersections would continue. In general, adding to the number of heavy vehicles along this already busy corridor would reduce amenity for homes, schools (such as Wiley Park Public School), businesses and pedestrians and re-create the poor amenity experienced on Parramatta Road by the impact of congested traffic and high number of heavy vehicles.

In addition, the corridor is an important transit corridor for buses and any upgrades would need to consider the needs of buses and their ability to pull into and out of bus stops without conflicting with heavy vehicles.

The key advantages of the M4-M5 Link are that traffic, particularly heavy vehicle traffic, would be removed from the surface roads so that air quality, amenity and safety is improved for people living and working along surface routes such as the A3 corridor, and secondly, that travel would be more efficient in a tunnel, without intersections.

The M7 Motorway primarily serves Sydney's west and was developed to respond to a need to connect the M2, M4 and M5 motorways, complete a substantial part of the NSW Government's Sydney Orbital Strategy and reduce travel times across western Sydney. Although the M7 Motorway performs an important north-south connection function in Sydney's strategic, given its location in western Sydney, the M7 Motorway is not an alternative to the project, with both the M7 Motorway and the M4-M5 Link necessary to facilitate efficient movement of dispersed freight and commercial movements, as well as longer distance recreational trips.

Improvements to the arterial road network (such as improving intersection performance and implementing traffic calming measures, lane closures or clearways) would only provide incremental change in the efficiency of the road network, and would not support the additional capacity required for regional traffic growth, which is associated with the forecast increase in Sydney's population and subsequent increases in VKT.

The project would contribute to reducing future traffic volumes parallel routes heading east including City West Link and Parramatta Road. The screenline analysis in Chapter 9 of Appendix H (Technical working paper: Traffic and transport) of the EIS found that as a result of the new roadway links provided by the project, the two-way future year AWT traffic demand compared to a 'without project' scenario is predicted to significantly decrease on City West Link and Parramatta Road, east of the M4 East Wattle Street and Parramatta Road ramps respectively, by about 25 per cent in 2023 and 2033 'With project' and 'Cumulative' scenarios.

A congested road network also affects road-based public transport, resulting in increased bus travel times and journey time variability. The project also complements the vision established in the *Draft Towards our Greater Sydney 2056* by providing part of a transport network to support population and commercial growth in western Sydney.

As detailed in Chapter 8 (Traffic and transport) of the EIS, between 2023 (nominal year of opening) and 2033 (10 years after the nominal year of opening), reductions are predicted in peak period travel times between the M4 corridor and the Sydney Airport/Port Botany precinct, with traffic shifting from the A3 (King Georges Road) corridor to the M4-M5 Link. This would improve the efficiencies of commuter, intrastate and interstate freight movements through travel time savings and reduced operating costs.

Linking the M4 East and New M5 motorways is only one of a number of project objectives. The Rozelle interchange and Iron Cove Link are consistent with other project objectives including improving traffic conditions and reducing congestion on key arterial roads in proximity to the project and enabling long-term motorway network development by providing a connection to the proposed future Western Harbour Tunnel and Beaches Link project to the north.

A potential northern extension for the project has been identified since 2014, with the *State Infrastructure Strategy Update 2014* (Infrastructure NSW 2014) identifying a 'northern extension' (which is realised for the M4-M5 Link in the Rozelle interchange) that would enable:

- A connection to the Sydney CBD via Anzac Bridge, as well as to Victoria Road
- A connection to the proposed future Western Harbour Tunnel project, which together with the M4-M5 Link, would create a western bypass of the Sydney CBD
- Connectivity to The Bays Precinct
- Reduction in surface traffic along Parramatta Road.

C3.2.9 Submissions in support of the project's justification

Several submitters acknowledged support for the project. Specific issues raised in support of the project include:

- Belief that the project is the way for Sydney's infrastructure to cope with the increasing traffic demands in the inner city
- The M4-M5 Link is necessary to provide safety, social, economic, cultural, environmental, travel and amenity benefits to the local community, wider Sydney and NSW in general by linking key strategic motorway networks together
- The WestConnex program of works is essential for Sydney to be considered to be a modern city on the world stage.

Response

The support for the project is noted.

C3.2.10 Project encourages dependency on cars

Submitters raised concerns that the project would increase dependency on cars. In particular submitters raised the following issues:

- The project encourages use of private road transport and ignores literature that explains how projects such as WestConnex entrenches car dependency
- Sydney's 69 per cent private vehicle usage is the cause of the city's massive congestion, and construction of toll roads will only promote additional private vehicle use
- The project will reinforce car dependence in Sydney. A sizeable proportion of the community do not have ready access to a motor vehicle, cannot legally drive or do not want to drive
- Other motorway projects have shown that the provision of additional capacity will result in additional traffic and congestion, which questions the need for the project
- Roads and Maritime will have to solve congestion problems created by car dependency.

Response

As part of the WestConnex program of works, the project delivers on the NSW Government's plans to deliver an integrated transport solution, comprising roads and public transport and active transport, to address congestion on Sydney's roads. WestConnex is only one of many projects identified to address congestion.

Since the preparation of the EIS, the *Draft Future Transport Strategy 2056* (NSW Government 2017) was released for public comment in tandem with the *Draft Greater Sydney Region Plan* (Greater Sydney Commission 2017). The *Draft Future Transport Strategy 2056* is an update of the *Transport Master Plan* and sets the vision, direction and outcomes framework for commuter mobility in NSW and aims to guide transport investment over the longer term. The draft strategy identifies the WestConnex program of works, which includes the project, as a 'city-shaping' project and also notes (as part of the Greater Sydney Services and Infrastructure Plan component of the strategy):

- Roads will continue to have an important role to play in Greater Sydney, supporting freight, on-road public transport and trips best served by car
- The road network in Greater Sydney is the city's largest transport asset and carries the majority of the Greater Sydney's transport and freight task
- A number of committed initiatives will support the expansion of the strategic road network, including WestConnex, NorthConnex and the Western Sydney Infrastructure Plan.

According to the Bureau of Transport Statistics' September 2014 Release Employment Forecasts (Bureau of Transport Statistics 2014), 60 per cent of jobs are outside of Sydney's major centres. Given the diffuse nature of employment and the diverse purposes of many trips, public transport is not able to provide a convenient alternative for a large proportion of travellers.

Around 70 per cent of commuters across metropolitan Sydney travel by car, while commuters only make up around 20 per cent of all trips across an average working day (Bureau of Transport Statistics 2014). The road network services a diverse array of transport purposes beyond transporting people to and from their place of employment, including:

- Commercial and freight users – large articulated trucks travel more than 25 billion tonne kilometres across the state per year, and rigid trucks around 10 billion kilometres per annum across the State (Transport for NSW 2013b)
- Light commercial vehicles – smaller commercial vehicles like vans, which make four times as many trips as larger trucks, make over 1.1 million trips in an average weekday (Transport for NSW 2013b).

In assessing the need for new road infrastructure, the *State Infrastructure Strategy* found that public transport was the best option for journeys to dense employment centres (such as the Sydney CBD and Parramatta), where public transport is already the preferred choice for many employees. However, the dispersed nature of the majority of Sydney's journeys means that the flexibility provided by the private car makes it the dominant choice. This demand pattern is the consequence of established land use patterns in Sydney.

The *State Infrastructure Strategy* also found that private road transport is, and would remain, the only viable option for most journeys in Sydney most of the time, even with the targeted growth in public transport and rail freight sought by the government, and the expected increase in the population density of the city. With this in mind, the NSW Government is making substantial investment in strategically important roads and public transport.

The project would support the economic development of Sydney by providing a high quality and efficient road connection for business and freight vehicles within the global economic corridor, including to and from Port Botany and Sydney Airport. This connectivity is identified in the priority actions to achieve the goals set in *A Plan for Growing Sydney*.

C3.3 Economic proposal (business case)

945 submitters raised issues regarding the economic business case for the project.

C3.3.1 Adequacy, quality and transparency of the business case

Submitters raised issues regarding the quality and transparency of the WestConnex business case, including:

- The business case is flawed, unsatisfactory and misleading. It is not evidence based and does not assess alternative transport solutions. It should be subject to independent analysis
- The WestConnex business case has a large amount of redacted information, mainly associated with traffic modelling and estimated toll revenue
- An independent review of the [WestConnex] concept is needed as a long term objective does not seem to have been included in the feasibility studies and cost benefit analysis
- The business case hasn't changed over the last 5-10 years and is therefore out of date
- The business case for the project was not adequate to justify moving to an EIS
- The business case did not attempt to cost the reduced use of public transport, especially the loss of fare revenue
- Ancillary road projects necessitated by the project, such as the potential $1 billion Alexandria-Moore Park Connectivity Upgrade, were not included in the business case
- The M4-M5 Link enables the expansion of the WestConnex network to include the Western Harbour Tunnel, Beaches Link and F6 Extension. These motorway projects were not part of the WestConnex business case, are not priority projects in any State or Australian Government roads plan, are not SSI and they should be removed from the EIS for this proposal and their respective proposals should be developed separately
- The business case is flawed as a result of the decision of the NSW Government to accept the project as part of the *State Infrastructure Strategy* before a business case was developed. There was no incentive to explore alternatives or to fully explore the costs and benefits
- Cost blowouts from preceding stages of WestConnex should have been factored into the M4-M5 Link EIS
- The business case did not incorporate costs associated with unforeseen construction impacts and remediation
- Concern that no cost benefit ratio was calculated for Phase 1 [Stage 1 - mainline tunnels] of the project only
- Concern about corruption in the business case process. Modelling for post-2031 conditions was not undertaken in the business case, however benefits were assumed to continue until 2052

- The business case did not factor in the loss of heritage to the whole community or road widening required by increased congestion caused by the project
- The original WestConnex business case was not released to the public, making it seem as if Sydney Motorway Corporation (SMC) was hiding details from the public
- Contracts have been let without a final business case for the whole WestConnex program being released or the project (the WestConnex program of works) being subjected to independent gateway reviews
- The cost benefit analysis was inadequate, and a more thorough cost benefit analysis should be undertaken
- A number of factors ranging from socio-economic aspects, transport requirements, air quality and water resources were not adequately assessed in the cost-benefit analysis
- Business case indicates that WestConnex will increase congestion.

Submitters raised concerns about the conclusions of the business case. Specific issues raised include:

- Insufficient justification was provided for the travel time savings and economic benefits, factored into the benefit cost ratio (BCR) for business and light commercial vehicles, for example there was insufficient analysis of origins and destinations of these trips
- The business case did not identify the M4-M5 Link as a priority for 'filling in the missing links in Sydney's motorway network'
- The business case was completed prior to the announcement of the second Sydney airport at Badgerys Creek, which would change the distribution of passenger and freight movements around Sydney
- The business case fails to take into account the external costs of the project such as air pollution, global warming, economic, health and social costs
- The business case does not reflect strategies and lessons learnt from preceding WestConnex projects
- The business case does not reflect global approaches to congestion management, such as demand management and transit investment.

Submitters raised concerns about the adequacy of data supporting the business case. Specific issues raised include:

- Concern that the business case does not appropriately assess separate proposed toll roads such as the Western Harbour Tunnel, Beaches Link and the Sydney Gateway. It is unclear which traffic scenario the business case best reflects
- The business case suggests that WestConnex would help renew Parramatta Road by reducing traffic on it, despite the modelling showing that traffic would increase on this road
- Insufficient justification was provided for the significant travel time savings, and economic benefits, factored into the BCR for business and light commercial vehicles. There was insufficient analysis of origins and destinations of these trips
- The business case did not factor in the impact of longer total journey lengths on urban sprawl, which will have a flow on cost for infrastructure and servicing
- Concern that the business case is flawed as the payment of tolls is required which would result in the community being left to pay for the project
- Toll earnings and financial viability of the project have been incorrectly identified, through incorrect traffic modelling.

Response

The WestConnex Updated Strategic Business Case

WestConnex was a key initiative recommended in the NSW Government's *State Infrastructure Strategy* which was prepared by Infrastructure NSW to provide independent advice on the infrastructure needs of the state. WestConnex has been assessed as a program of works and a motorway network in the *WestConnex Strategic Business Case* which was approved by the NSW Government in August 2013. In November 2015, the *WestConnex Updated Strategic Business Case* was released, which consolidated the work undertaken in the original business case and incorporated further development in the program of works and feedback received from stakeholders. The enhancements included in the updated strategic business case are:

- The realignment of the M4-M5 Link with a 'northern extension' being incorporated that would duplicate City West Link to Rozelle, providing connectivity to Anzac Bridge and Victoria Road
- Works to enable connectivity with the proposed future Western Harbour Tunnel and Beaches Link and Southern Connector [now the F6 Extension]
- Improved connections to the Sydney Airport and Port Botany precinct.

The business case assessed all the WestConnex projects namely M4 Widening, M4 East, King Georges Road Interchange Upgrade, New M5 and the M4-M5 Link on an incremental basis, with and without each component project. The M4-M5 Link project is a critical component of the WestConnex program of works, as it links the M4 East at Haberfield with the New M5 at St Peters, and as a result, allows the full benefits of WestConnex to be realised. The business case did not assess separate Stages 1 and 2 of the project (ie the mainline tunnels and Rozelle interchange plus Iron Cove Link), as these stages were not proposed at the time the business case was prepared.

Proposed future projects such as the Western Harbour Tunnel and Beaches Link program of works and the Sydney Gateway and F6 Extension projects are assessed in the EIS in the context of cumulative impacts with the M4-M5 Link to provide a conservative assessment of traffic conditions should these projects be approved. These projects are not part of the WestConnex program of works and are subject to separate business cases, environmental assessment and approval. SSI applications have been lodged for the Western Harbour Tunnel, Beaches Link and F6 Extension projects to commence the environmental assessment stages of these projects.

The *Updated Strategic Business Case* has been written in accordance with the requirements of the NSW Treasury *Guidelines for Capital Business Cases*, as well as Infrastructure NSW and Infrastructure Australia requirements. These include recommendations by both the NSW Auditor General and Infrastructure Australia resulting from reports prepared by these bodies on aspects of WestConnex, which have been considered and incorporated into the *Updated Strategic Business Case*. All relevant information supporting the *Updated Strategic Business Case* has been transparently and publicly released, except in limited circumstances where to do so would be contrary to the public interest or position of the State for commercial or legal reasons.

In accordance with the recommendation by the NSW Auditor-General that major projects and key documents, such as the *Updated Strategic Business Case*, be subject to the Infrastructure Investor Assurance Framework designed by Infrastructure NSW, the *Updated Strategic Business Case* has been through a transparent and externally managed Business Case Gateway Review.

The business case considered traffic modelling to forecast traffic flows and changes on the future road network in 2031. Linear interpolation was used to estimate the benefits up to 2031 and for benefits beyond 2031, a 'decay' function was used which assumes there would be plateauing over time due to increased traffic resulting from population growth. This was a conservative approach.

The *Updated Strategic Business Case* was completed in 2015, prior to completion of other WestConnex component projects and therefore 'lessons learnt' from these projects are not included in the business case.

Impacts from the M4-M5 Link project, such as on heritage, air pollution, congestion, global warming, economic, health and social costs have been considered in detail in the EIS (refer to Chapters 8-26 of the EIS). The *Updated Strategic Business Case* was prepared in accordance with the NSW Treasury requirements. A degree of conservatism is built into the economic analysis in the business case to allow for design changes as a result of project impacts assessed in the EIS.

The NSW Government is committed to investing in a range of public transport projects. The *NSW Transport Master Plan* provides a framework for delivering an integrated, modern and multi-modal transport system, identifying NSW's transport actions and investment priorities for the next 20 years. Public transport and rail freight options are complementary to the project and WestConnex as a whole. Strategies to deliver an integrated package of transport improvements in parallel with the construction of WestConnex are recognised in the *Transport Master Plan*. The provision of the project is not expected to impact revenue received from public transport.

The business case proposed that funding of WestConnex would be facilitated by user pays contributions to reduce the overall burden on the wider NSW taxpayers. Inclusion of a toll makes construction of the project affordable and equitable, as the cost is shared between taxpayers and individual users of the M4-M5 Link.

Roads and Maritime is working on a range of road upgrades, including the Alexandria to Moore Park Connectivity Upgrade, which was not included in the business case for the WestConnex program of works, as its scale and size warrants that it be considered as a separate project. Further, the concept for the upgrade project could only be developed once assessment of the New M5 project was more advanced. The upgrade project is designed to improve connectivity, reduce congestion and support urban renewal on the southern outskirts of the Sydney CBD and integrate with key infrastructure projects (including the New M5 and CBD and South East Light Rail). It has a number of objectives and integration with WestConnex is only one of these objectives.

Conclusions of the business case

The economic appraisal completed as part of this *Updated Strategic Business Case* concluded that WestConnex would deliver $1.71 in benefits for every one dollar spent when assessed without reference to the wider economic benefits of the projects. When the wider economic benefits are considered this rises to $1.88 in benefits for every one dollar spent. The BCR is a measure of the net benefit to society derived from the capital investment in the project.

For the M4-M5 Link project, the BCR has been calculated as $2.38 or $2.94 with wider economic benefits. These ratios indicate an economically viable proposal.

The investment in the WestConnex program of works would facilitate improvements across the network and generate more than $20 billion worth of benefits to the Australian economy. For the M4-M5 Link itis estimated that based on a five-year construction period, around 14,300 direct (onsite) job years would be created between 2018 to 2023, which is equivalent to around 2,800 jobs per annum. Furthermore, about 42,300 indirect (offsite) job years would be generated, equivalent to around 8,400 jobs per annum based on the project period.

Data supporting the business case

The operational traffic modelling used for the business case has been undertaken at a strategic level, which forecasts the expected changes to traffic numbers on the broader road network due to WestConnex, as well as the performance of the motorway. The strategic modelling has been used to build road network base models (the 2012 network situation), which have been validated against existing network traffic flows and journey times. These base models have been used to forecast traffic flows and changes on the future road network in 2031, both with and without WestConnex. The proposed future Sydney Gateway project has been assumed to be part of WestConnex program of works for the traffic modelling undertaken for the business case. However, traffic forecasts for the proposed future Western Harbour Tunnel and Beaches Link program of works and F6 Extension were not included in the business case modelling but have been assessed as part of the cumulative traffic scenarios in the M4-M5 Link EIS.

For each modelled year, outputs were provided for various times of day and for five vehicle types, including business and business registered light commercial vehicles. Traffic modelling was developed and calibrated using observed survey data, and reviewed by expert technical and independent peer reviewers, which is further discussed in **section C8.12**.

The business case does not indicate that WestConnex would increase congestion. As outlined in Chapter 3 (Strategic context and project need) of the EIS, without WestConnex, by 2031 travel speeds and congestion would significantly worsen on the road network serving western and southwestern Sydney (including the M4 Motorway, Parramatta Road, City West Link and the M5 motorway corridor) and connections to Sydney Airport and Port Botany (eg the M1 motorway corridor ie Southern Cross Drive/Eastern Distributor). Congestion would also be a major issue on the key north–south links that connect the M4 and M5 motorway corridors (eg the A3 corridor ie Centenary Drive/Roberts Road/King Georges Road), even with planned future public transport enhancements (SMC 2015a).

As detailed in Chapter 8 (Traffic and transport) of the EIS, between 2023 (nominal year of opening) and 2033 (10 years after the nominal year of opening), reductions are predicted in peak period travel times between the M4 corridor and the Sydney Airport/Port Botany precinct, with traffic shifting from the A3 (King Georges Road) corridor to the M4-M5 Link. The project, together with the other WestConnex component projects, would also result in a reduction of traffic along sections of Parramatta Road by around 26 per cent in 2023 and around 27 per cent in 2033 (refer to Table 9-1 of Appendix H (Technical working paper: Traffic and transport) of the EIS. The project would improve the efficiencies of commuter, intrastate and interstate freight movements through travel time savings and reduced operating costs.

The WSA at Badgerys Creek has been considered in the assessment of traffic and transport impacts from the M4-M5 Link as it is included in the land use and employment projections assumed in the traffic model. The WSA EIS (Department of Infrastructure and Regional Development and Cities 2016) acknowledges that Sydney Airport would continue to be the most important airport in the Sydney region for the foreseeable future, with overall demand at Sydney Airport expected to continue to grow to 51 million passengers annually by 2030, 72.7 million passengers by 2050 and 85.3 million passengers annually by 2075.

C3.3.2 Comparison of business case against other reports

Submitters raised concerns that other reports contradict the findings of the business case. Specific issues raised include:

- The EIS does not engage with the critical review by SGS Consulting of the 2015 *WestConnex Updated Strategic Business Case*
- Audits undertaken by the NSW Auditor General and the Australian National Audit Office found deficiencies in the business case.

Response

City of Sydney Council report

It is not within the scope of the EIS to address feedback on the *WestConnex Updated Strategic Business Case*.

However, a review of the SGS Consulting report, produced for City of Sydney Council, was undertaken separately to the EIS process. This review determined that the different estimates of toll use behaviour used in the SGS analysis brought into question a number of its findings and commentary on the WestConnex program of works. The assessments for the M4-M5 Link project use the WRTM, which has been refined over a number of years and produces robust forecasts. WRTM v2.3 used in the M4-M5 Link traffic assessment factors in population and employment growth for the Sydney metropolitan area as projected by the DP&E and the Transport for NSW Bureau of Transport Statistics. The forecast considers the effects of public transport schemes that are proposed for Sydney such as the CBD and South East Light Rail, North West Rail Line, South West Rail Line, and Sydney Rapid Transit Proposal. The model also looks at other proposed future related road projects (such as Sydney Gateway, Western Harbour Tunnel and Beaches Link, the F6 Extension and the WSA) and how these would interact with the WestConnex program of works.

The EIS for the M4-M5 Link is therefore based on a traffic model with realistic demand forecasts.

NSW Auditor-General report

Both the NSW Auditor-General and Infrastructure Australia have released reports on various aspects of WestConnex. In December 2014, the NSW Auditor-General released a performance audit that examined the assurance processes around WestConnex. The Auditor-General found that while there were a number of good practices already in place, WestConnex should be subject to the Infrastructure Investor Assurance Framework, designed by Infrastructure NSW. In particular, the Auditor-General highlighted the need for externally managed reviews of major projects and key documents, such as the business case.

SMC acknowledged and supported the recommendations made by the Auditor-General. The business case has been subject to an externally managed Business Case Gateway Review, under the Infrastructure Investor Assurance Framework.

This business case recognised and responded to the recommendations from the NSW Auditor-General. In particular, the Auditor-General recommended that:

'… the business case … be formally and thoroughly revisited for stages 2 and 3 of the project as well as any other major changes to the scope' [6].

In relation to this recommendation, formal reports were submitted to the NSW Government addressing the business case for Stages 2 and 3 of the WestConnex program of works. The *Updated Strategic Business Case* consolidated that work and included the revised cost benefit analysis for the entire WestConnex program of works.

C3.3.3 Benefit cost ratio queries and concerns

Submitters raised concerns regarding the benefit cost ratio for WestConnex and the project. In particular the following issues were raised:

- No BCR is used to assess the potential economic viability of the project and no consideration of the opportunity cost of an alternative project is given
- The resulting congestion would mean that the BCR for WestConnex would fall well below 1:1 and prove to be a burden for taxpayers and investors
- The EIS does not acknowledge the City of Sydney's assessment that the BCR for WestConnex may be lower than 1:1
- Misrepresentation of the WestConnex BCR as $1.71 when it was calculated as $1.64 according to a study commissioned by City of Sydney Council
- The cost and disruption of the WestConnex tunnels and toll roads do not demonstrate an appropriate cost benefit under any reasonable scenario
- Concern that the Return on Investment has been optimistic and not based on usage levels. A lower ROI would lead to lower tolls and higher usage
- The BCR does not account for future projects such as the Western Harbour Tunnel and Beaches Link and the F6 Extension
- Concern that the construction costs were too conservative – if these costs rise, the cost benefit ratio would reduce accordingly
- The entire combination of alternatives would in sum be cheaper than WestConnex, however a cost benefit analysis of this was not undertaken
- The BCR is heavily reliant upon the operational traffic modelling. Concern that the underestimation of traffic impacts has significantly affected the BCR
- The business case did not identify Stage 3 of WestConnex (the M4-M5 Link) as a priority
- The cost of health impacts was not sufficiently factored into the business case
- Costs of traffic congestion and future projects are not sufficiently factored into the conclusions of the cost benefit analysis
- The actual project cost has been underestimated leading to an overestimated BCR
- More consideration should be given to the cost benefit analysis of the Rozelle interchange
- The cost benefit analysis should either include the Sydney Gateway project and its cost, or else exclude any of its benefits
- Travel time savings are a key component of the positive BCR. A significant proportion of these supposed benefits arise from travel time savings were within the margin of error of modelling, or would be so small that motorists may not notice them (and therefore would not value them). Research has found that business travellers are more concerned with predictability and reliability of travel times than they are with actual travel time.

[6] Hehir, G 2014, New South Wales Auditor-General's Report Performance Audit – WestConnex: Assurance to the Government Audit Office of New South Wales, Sydney.

Response

The *WestConnex Updated Strategic Business Case* has been written in accordance with the requirements of the NSW Treasury *Guidelines for Capital Business Cases*, as well as Infrastructure NSW and Infrastructure Australia requirements. These include recommendations by both the NSW Auditor General and Infrastructure Australia resulting from reports prepared by these bodies on aspects of WestConnex, which have been considered and incorporated into the *Updated Strategic Business Case*. All relevant information supporting the *Updated Strategic Business Case* has been transparently and publicly released, except in limited circumstances where to do so would be contrary to the public interest or position of the State for commercial or legal reasons.

The economic appraisal completed as part of the *Updated Strategic Business Case* concluded that WestConnex would deliver $1.71 in benefits for every one dollar spent when assessed without reference to the wider economic benefits of the projects. When the wider economic benefits are considered this rises to $1.88 in benefits for every one dollar spent. The BCR is a measure of the net benefit to society derived from the capital investment in the project.

For the M4-M5 Link project, the BCR has been calculated as $2.38 or $2.94 with wider economic benefits meaning that for every dollar invested, the project would return $2.38 or $2.94 respectively. These ratios indicate an economically viable proposal.

The economic analysis for the WestConnex program of works namely M4 Widening, M4 East, King Georges Road Interchange Upgrade, New M5 and the M4-M5 Link, determined that WestConnex would create benefits that would outweigh the upfront construction costs and ongoing operational costs. The economic analysis adopts the NSW Treasury definition for the BCR metric, defined as the present value of benefits less the present value of operating costs, divided by the present value of capital expenditure. The BCR is therefore a measure of net benefit to society derived from the capital investment in the project.

A sensitivity analysis was done as part of the economic appraisal to test potential changes to the BCR. The analysis showed that even with increased capital and operational costs of 30 per cent, WestConnex remained economically viable. Similarly, sensitivity analysis was done with and without the Sydney Gateway project, with the results showing a BCR of greater than 1:1, indicating WestConnex remained viable. The WestConnex Full Scheme: Economic Appraisal (KPMG 2015) provides additional information on the analysis approach and can be accessed from the WestConnex website[7]. A separate cost benefit analysis was done for the M4-M5 Link. The BCR has been calculated as $2.38 or $2.94 with wider economic benefits. This is for the whole project which includes the mainline tunnels, Rozelle interchange and Iron Cove Link and does not consider these components separately.

As noted in the *Updated Strategic Business Case*, the estimated costs for WestConnex include a reasonable contingency allowance to cover cost escalation, consistent with standard practice. There is also a level of conservatism built into the cost to allow for changes to the project design as it develops.

Operational traffic modelling utilises the WRTM v2.3, which has been refined over a number of years and produces robust forecasts. WRTM v2.3 is used in the M4-M5 Link traffic assessment factors in population and employment growth for the Sydney metropolitan area as projected by DP&E. The assessment of travel time for the 'With project' and 'Without project' scenarios is described in Appendix H (Technical working paper: Traffic and transport) of the EIS.

Further information on the business case and cost benefit analysis is provided in **section C3.3.1**.

[7] www.westconnex.com.au

C3.4 Project cost and financial risk of the M4-M5 Link and WestConnex

302 submitters raised issues regarding the cost associated with the M4-M5 Link and the overall WestConnex program of works.

C3.4.1 Cost of the project and the WestConnex program of works

Submitters raised concerns regarding the cost of the WestConnex program of works, including the project, and the increasing budget:

- The M4-M5 Link would be a waste of public funds and does not represent value for money
- The cost of WestConnex is too high considering only a small proportion of the population would benefit from it
- Concern over the $16.8 billion already spent on WestConnex and that this may climb to $45 billion
- The M4-M5 Link is a waste of money and excluding this stage may help the entire WestConnex program of works meet its proposed budget
- Future road upgrade works required as a result of the M4-M5 Link have not been considered in the costs of the project
- The cost of the WestConnex cannot be assured and is escalating with considerable overspend
- The cost of the M4-M5 Link is undervalued as it did not consider the cost of destruction of heritage buildings, reductions in public transport and outdoor air pollution
- Taxpayers should not have to fund repairs to homes caused by private contractors
- WestConnex is financially unviable and would cause a significant lost opportunity cost for all of NSW. WestConnex is likely to undermine the economic effectiveness of NSW. WestConnex will be sold at a huge loss to the State
- Concern that the budget for WestConnex is $45 billion yet 50 per cent of it is being sold for $5 billion
- The M4-M5 Link budget is not adequate
- Costs keep increasing
- The Darley Road civil and tunnel site (C4) is going to cost taxpayers $50 million
- Concern that the money that could have been spent on upgrading roads and public transport is instead being used to fund this project.

Submitters also raised concerns that additional road improvements may be needed elsewhere on Sydney's transport network as a result of the project. The following concerns were raised:

- Additional roadworks required to address impacts of the toll road have not been addressed or budgeted for
- No attempt has been made to realistically review the costs of added on projects and road work that is being planned as a consequence of WestConnex
- Concern that additional integration works are not attributed to the WestConnex budget, and instead will impact on the available Roads and Maritime budget for the State road network normal maintenance and improvement budget
- The taxpayers will have to pay for these additional costs.

Response

As described in **section C3.2**, the economic appraisal, including cost benefit analysis, for the WestConnex program of works and the M4-M5 Link, show that the benefits outweigh the costs and would yield long term benefits for the greater Sydney region. The project is therefore financially viable and justified in that it would meet the expected objectives (see **section C3.6** for a further discussion of project objectives).

The $16.8 billion figure is the capital cost estimated for the whole of the WestConnex program of works (including the M4 Widening, M4 East, King Georges Road Interchange Upgrade, New M5 and M4-M5 Link), as presented in the *WestConnex Strategic Business Case*. This figure takes into account enhancements to the scheme since the initial reference design in 2013, which include:

- The realignment of the M4-M5 Link, with a 'northern extension' being incorporated, which duplicated City West Link to Rozelle, providing connectivity to Anzac Bridge and Victoria Road
- Works to enable extension of the M4-M5 Link to connect with the proposed future Western Harbour Tunnel and Beaches Link and F6 Extension (via the New M5).

The cost for the M4-M5 Link project, as included in the budget for the WestConnex program of works, is around $7 billion. The cost estimate includes reasonable contingency allowances for increases in construction costs. Other related projects, such as the proposed future Sydney Gateway (the WestConnex budget includes a $800 million allowance for Sydney Gateway however this sum will not necessarily cover the entire cost of the project), F6 Extension and Western Harbour Tunnel and Beaches Link program of works, are not part of WestConnex and would be subject to their own business cases and would have their own budget. The same applies to other Roads and Maritime road improvement and network development projects, such as the Alexandria to Moore Park Connectivity Upgrade. Any integration works for the project as described in Chapter 5 (Project description) of the EIS are included in the project budget.

The costs associated with mitigating project impacts and compensation for damages caused during construction of the project will be borne by the design and construction contractor(s) and would be factored into the construction cost during the tender process. For further information on compensation for damages, see **section C14.13**.

Supplementary funding (in addition to government contributions and private sector debt financing) of WestConnex, as proposed in the *WestConnex Updated Strategic Business Case*, assumes a distance based toll would be implemented on operation of each component project. Distance based tolling means that motorists would only pay tolls for the sections of the motorway they use. The proceeds of tolls on earlier component projects, once operational, would be applied to fund the construction of other components of the WestConnex program of works. For the M4-M5 Link project, the NSW Government will recover costs on the project by divesting (selling) 51 per cent of SMC (not the WestConnex program of works) (see **section C1.5** for further details on the sale of SMC). The NSW Government will therefore retain a 49 per cent interest in the project. Delivery of the WestConnex program of works, including the project, remains the responsibility of the proponent, Roads and Maritime.

The funding set aside for the WestConnex program of works does not preclude the development of other public transport and road upgrade programs. The NSW Government has been investigating and investing in public transport, including investing $41.5 billion (2016–2017 NSW Budget) in transport projects over the next four years (including roads and public transport). See **section C3.2.3** for further detail on how WestConnex, including the project, supports integration with public transport improvements.

C3.4.2 Financial risk of the project and the WestConnex program of works

Submitters were concerned with the financial risk of the project or the WestConnex program of works, including the following issues:

- The final cost of the WestConnex program of works would be outside of the governments control
- Billions of dollars of public money are being paid to private companies, however the public and not the private sector would carry the risk of the project
- Due to the indicative nature of the EIS, construction costs will blow out. In particular, the uncertainty around how the Rozelle interchange would be constructed is financially risky
- If the motorway fails, the public would be forced to pay for it through tolls and degradation of amenity. The cost of WestConnex would never be paid off and infrastructure budgets would be impacted for decades
- The cost of the development is continually changing. There is a risk the costs could increase even more. The construction costs of WestConnex have been underestimated

- There is a potential implication of bankruptcy (as seen previously for the Lane Cove Tunnel, Cross City Tunnel and BrisConnex [Clem7 Tunnel]) as a result of over-optimistic traffic modelling informing the project
- Over-estimated toll earnings due to poor traffic modelling will result in the government subsidising the motorway owner for lost earnings.

Response

As described in the *Updated Strategic Business Case*, WestConnex would be financed through user tolling in the long term, supported by short to medium term investment by both government and the private sector. SMC has been established to deliver WestConnex, and the NSW Treasurer and NSW Minister for Roads, Maritime and Freight are the shareholders on behalf of the State. Separate project entities established for the delivery of each stage of WestConnex are wholly owned subsidiaries of SMC. These entities do not represent the State and are expressly not guaranteed by the State. Any debt raised would be self-supporting and without recourse to the State, that is, there is no government guarantee. This structure supports future sell-down to the private sector, therefore even with the planned 51 per cent sale of SMC, it is the private sector that carries the risk of the project, with SMC being responsible for the project construction (see **section C1.5** for further details on the sale of SMC).

A full financial appraisal for the project is presented in the *Updated Strategic Business Case*. The appraisal is based on NSW Treasury's TPP07-4 *Guidelines for Financial Appraisal* and TPP08-05 *Guidelines for Capital Business Cases* and presents calculated project cash flows. The budget for the project is a portion of the overall budget allocation for the WestConnex program of works, with the split as shown in the *Updated Strategic Business Case.* The project budget reflects the scale and complexity of the project as shown in the concept design, particularly at the Rozelle interchange. The economic analysis for the project shows that the project can be delivered within the allocated budget of around $7 billion.

The design and construction procurement process allows the design and construction contractor(s) to propose the best-value solutions that will meet the technical road design requirements based on the project as described in the EIS, and to be consistent with the environmental management measures and conditions of approval for the project. The contractor would do this within the budget allocated to the project.

The traffic forecasting and modelling undertaken for the EIS (refer to Appendix H (Technical working paper: Traffic and transport) of the EIS), which informs the assessment of toll revenues for the project, is based on assumptions that represent the best available information at the time. The model and its outcomes have been reviewed by independent technical specialists, Roads and Maritime subject matter experts and is also being peer reviewed by DP&E.

C3.4.3 Ongoing maintenance costs

Submitters raised concern regarding the ongoing building and maintenance cost of the project and the justification of these costs. The following particular concerns were raised:

- Concern that running high-powered ventilation fans would constitute significant costs. Would these costs be absorbed by the public or the operator
- Who would pay for the establishment of parks.

Response

In the *Updated Strategic Business Case*, operational and maintenance costs, including the ventilation requirements, have been modelled on a quarterly basis and then aggregated to annual cash flow. Operations and maintenance and lifecycle costs have been provided on a real basis, and are escalated on an annual basis in the model from a 2015 base date.

The sensitivity analysis undertaken as part of the economic appraisal showed that WestConnex remains economically viable against potential cost increases of up to 30 per cent to both capital and operating costs. The economic analysis found that WestConnex, including the M4-M5 Link project, would create benefits that would outweigh the initial upfront construction cost and ongoing operational costs.

Benefits of the M-M5 Link project would include the provision of new areas of open space, particularly in the area of the Rozelle interchange. The urban design principles and objectives for the project (refer to section 13.2.2 of the EIS) form the basis for the development of detailed plans that would identify the types and locations of open space that would be provided by the project, or enabled for future provision by others. These would be determined in consultation with relevant stakeholders and the community, and in consideration of broader strategic planning objectives, and would be documented in Urban Design and Landscape Plans that would be prepared for the project.

C3.5 Tolling

715 submitters raised issues regarding the need, costs and duration of tolling from the project. Toll costs are discussed in section 3.2 of the EIS and the impacts of tolling are discussed in Chapter 14 (Social and economic) of the EIS.

C3.5.1 Need, cost and duration of tolling

Submitters raised issues regarding the tolls for the M4-M5 Link and the WestConnex program of works including:

- What would the toll costs be?
- Concern regarding lack of justification for tolling
- Concern that the public would have to pay tolls
- Concern that tolling has been implemented to benefit private businesses
- The tolls that would be imposed are unjustifiable and excessive
- Motorists would be asked to pay up to $20 a day in tolls
- Toll costs would increase over time
- Request that tolls only be increased in line with the CPI and concern that the toll cost is being constantly increased by either CPI or four per cent, whichever is greater
- Confusion around the CPI model that the tolls would be based on
- The toll costs of using the WestConnex motorway have not been finalised
- Concerned that the revenue from tolls is the ultimate objective of the project
- High toll costs would be paid by commuters who would still be stuck in traffic
- A lack of detailed assessment in the EIS will lead to extra construction costs that consequently would increase the toll cost
- A mitigation measure is needed for an unexpected tunnel accident event including terrorist attacks that would increase construction costs and consequently the toll cost
- Compensation claims or negotiated underwriting could materially undermine the State budget position and lead to an increase in the cost of tolling
- Objection to tolling drivers who have no decent public transport alternative from west of Parramatta
- Query on whether public buses would be required to pay the toll
- Independent regulation of toll charges should be investigated
- Cost of tolls would result in the cost of using the project outweighing its benefits
- Concern that the public would pay for the project twice, once in tax and again in tolls.

Response

A tolled motorway applies a 'user-pays' principle to the provision of the faster alternative route compared to existing routes. This principle aims to fund the improved infrastructure through contributions from those who would benefit the most, rather than paying for the project out of general government revenue which is raised from tax payers across NSW, not just those in Sydney that would benefit. This model is considered fair by Transport for NSW as the NSW Government alone cannot fund all infrastructure investment required in NSW. This model also accords with the Australian Government's *National Public Private Partnership Guidelines* (2015), which sets out the basic case for user charging, noting that this allows infrastructure investment to be brought forward. This in turn provides for improved economic growth and efficiencies, providing benefits across the state in both the short and long term.

Key considerations in the approach to tolling are outlined in the *Updated Strategic Business Case* and include such elements as: distance based tolling, higher tolls for heavy vehicles and minimum and maximum charges. In setting the toll for the project the NSW Government's tolling principles have been applied, which are:

1. New tolls are applied only where users receive a direct benefit
2. Tolls can continue while they provide broader network benefits or fund ongoing costs
3. Distance-based tolling for all new motorways
4. Tolls charged for both directions of travel on all motorways
5. Tolls charged reflect the cost of delivering the motorway network
6. Tolls take account of increase in expenses, income and comparable toll roads
7. Tolls will be applied consistently across different motorways, to the extent practicable, taking into account existing concessions and tolls
8. Truck tolls at least three times higher than car tolls
9. Regulations could be used so trucks use new motorway segments
10. Untolled alternative arterial road remain available for customers.

The setting of tolls is a matter for the NSW Government. Tolling fees have been determined based on the government's principles for tolling and are comparable with other tolling regimes in Sydney. The setting of tolls is independent of construction costs of the project and therefore construction cost over runs or changes resulting from the detailed design process would not result in higher tolls.

Toll amounts and rates at which tolls can be increased on WestConnex assets is defined in the relevant project deeds (that is, the agreement between the concessionaire and the NSW Government/Roads and Maritime) which are publicly available on the Roads and Maritime website.

As stated in the *Updated Strategic Business Case*, the reference tolling regime developed for WestConnex is consistent with regimes applied to other toll roads in Sydney and has been prepared in line with the NSW Government's tolling principles.

A common tolling approach would be applied across all WestConnex motorways:

- Distance based tolling: This approach has been successfully used on the Westlink M7 Motorway since its opening and is accepted as an equitable approach that reflects appropriate charges for journeys of different lengths
- Higher tolls for heavy vehicles: Most Sydney toll roads charge heavy vehicles a multiple of two to three times the charge for light vehicles. This reflects the additional wear and tear caused by heavy vehicles and the fact that freight transport is a significant driver for the WestConnex project
- Minimum charge - flagfall or connection charge: A charge at particular access/exit points on WestConnex reflects the high cost of providing motorway connections and better reflects the true cost and value of short trips on WestConnex
- Maximum charge - toll cap: As on the Westlink M7 Motorway, the total toll would be capped at a certain level to provide certainty to users and improve the overall value for money to the community.

As described in section 3.2.3 of the EIS, tolls for the entire WestConnex motorway would be capped at a maximum amount of $8.60 (2017 dollars) for cars and light commercial vehicles, after around 16 kilometres, with the total length of the WestConnex motorway to be around 33 kilometres. Cars and light commercial vehicles would pay one third of the toll for heavy commercial vehicles. The maximum toll for the M4-M5 Link section of WestConnex will be $6.50 (2017 dollars). Tolls would escalate up to a maximum of four per cent or CPI per year (whichever is greater) until 2040. After that, CPI would apply.

Key benefits for motorists who pay tolls to use the motorway would include:

- Improved travel times
- Reduced operating costs from improved fuel efficiency and reduced wear and tear
- Improved safety.

Free, alternative traffic routes would remain available to those who choose not to use the tolled motorway. All vehicles using the M4-M5 Link motorway would have to pay the toll. Public transport projects being delivered by the NSW Government including Sydney Metro City and Southwest (currently under construction), Sydney Metro West (currently in planning phase) and Parramatta Light Rail (Stage 1 is underway and Stage 2 is in the planning assessment phase) would provide public transport alternatives west of Parramatta.

In November 2017, the NSW Premier announced a vehicle registration cashback scheme for motorists who spend more than $25 a week on tolls in NSW to claim free vehicle registration. The scheme (as announced) will be available for standard privately registered cars, utes, four-wheel-drives and motorcycles from 1 July 2018 and be backdated to July 2017. The scheme will not include trucks or other vehicles weighing more than 2,795 kilograms. This is expected to save the majority of motorists who apply to the scheme around $358 a year on registration costs, and some up to $715 a year.

C3.5.2 Length of time tolls would be in place

Submitters raised concerns over the length of time tolls would be in effect for the M4-M5 Link. In particular submitters queried the following:

- The project would force the public to use privatised toll roads for a time period that would span decades
- The toll way will be charged for forty years, and will only guarantee revenue to the private owner.

Response

The M4-M5 Link motorway would operate on the user-pays principle, which means motorists who use the motorway would be helping the NSW Government fund its development. The M4-M5 Link motorway (excluding the Iron Cove Link component) will operate with distance based tolls (similar to the Westlink M7 Motorway) meaning that users will only pay for the section of the motorway they use.

Free, alternative traffic routes would remain available to those who choose not to use the tolled motorway.

The relevant WestConnex project deeds provide that the period during which tolls would apply on WestConnex assets is due to end in 2060, regardless of when each section of motorway opens to traffic. This equates to a toll period of between 37 and 44 years, which is broadly in line with other toll roads, and enables this important piece of infrastructure to be delivered while minimising both the price of tolls and the contribution from taxpayers.

C3.5.3 Which sections of the road will be tolled

Submitters raised queries over which sections of WestConnex would be tolled, including:

- Request that tolls should not be applied to the Iron Cove Link
- The M4-M5 Link should be toll free indefinitely
- What guarantees are there that the Iron Cove Link will remain toll free
- Distance based tolling is misleading as people would be charged 65 per cent of the maximum toll to use only 18.75 per cent of the road thus using shorter trips to subsidise longer trips across the project.

Response

The Iron Cove Link component of the M4-M5 Link project will not be tolled. This commitment was made by the NSW Government when the Iron Cove Link was announced in July 2016.

The remainder of the M4-M5 Link project would be tolled, as described in section 3.2.3 of the EIS. The maximum toll for the M4-M5 Link would be $6.50 (2017 dollars). The maximum toll for WestConnex will be capped at $8.60 (2017 dollars) once at least 16 kilometres has been travelled.

As described in **section C3.5.1**, tolls would be applied for the M4-M5 Link as part of the funding model for this critical State significant infrastructure. Tolls would apply until 2060.

As discussed in **section C3.5.1**, the application of distance based tolling is one of the NSW Government's key tolling principles. This approach is regarded as an equitable approach that reflects appropriate charges for journeys of different lengths. Distance based tolling would be applied for the M4-M5 Link. The tolling rate per kilometre reduces based on the overall distance travelled on the motorway network.

C3.5.4 Use of toll revenue

Submitters suggest that the revenue from toll payments should be used on investments for improving other areas of Sydney's transport network, specifically on:

- Improving public transport in the western areas of Sydney
- Funding public transport and associated infrastructure.

Response

Toll revenue will be held by the asset owner, meaning that the relevant shareholders will receive dividends. Depending on the ownership structure, the NSW Government, as a shareholder, would receive a portion of the revenue. How this revenue is used is a matter for the NSW Government.

C3.6 Objectives

919 submitters raised issues regarding the stated project objectives. The WestConnex objectives and the project specific objectives are discussed in section 3.3 of the EIS.

C3.6.1 WestConnex does not meet its objectives

Submitters raised concerns that WestConnex would not meet the stated objectives generally including:

- WestConnex does not achieve its goals of improving Parramatta Road, providing access to Sydney Airport and port or improving commuter access from western Sydney
- WestConnex would not meet its objective of reducing congestion.

Submitters were also concerned that the objectives of WestConnex are too narrow and can therefore only be met by a new tolled motorway.

Response

The need, justification and objectives of the WestConnex program of works are set out in the *Updated Strategic Business Case*, which was approved by the NSW Government. As the M4-M5 Link is the final stage of the WestConnex program of works, operational traffic modelling undertaken for the project (the 'do minimum' or 'with project' scenario), which assumes the other WestConnex components projects are operational, presents a cumulative case for the WestConnex program of works.

The results of the traffic modelling (refer to Chapter 8 (Traffic and transport) or Appendix H (Technical working paper: Traffic and transport) of the EIS) do show a significant reduction in surface traffic along Parramatta Road east of the M4 East Wattle Street and Parramatta Road ramps including a forecast 26 per cent and 27 per cent reduction in the 2023 and 2033 'With project' scenarios respectively. This reduction in surface traffic would facilitate other government policies and strategies such as the *Parramatta Road Corridor Urban Transformation Strategy* which is designed to address urban redevelopment and improved public transport services along this corridor. Traffic modelling for the project also identifies improved travel times for commuters from western Sydney accessing the Sydney CBD or the Sydney Airport/Port Botany precinct, via the WestConnex motorway.

While the WestConnex motorway would reduce surface traffic on key arterial roads, it would not solve all the congestion problems on Sydney's roads. With the forecast growth in Sydney's population, future road network improvements would be required to continue to address congestion. Full motorway connectivity to Sydney Airport and Port Botany would be delivered by the Sydney Gateway project (currently in design development phase and subject to final business case and environmental assessment).

Key benefits forecast for the Sydney metropolitan road network as a result of the M4-M5 Link project include:

- Existing non-motorway (arterial and local) roads in the Inner West LGA are forecast to experience faster trips with the daily average speed increasing. Similarly, the vehicle distance travelled on non-motorway roads is forecast to reduce. This indicates that on average, these trips would be fewer in number and faster
- Reduced travel times are forecast on key corridors, such as between the M4 Motorway corridor and the St Peters interchange
- Reduced traffic forecast on sections of major arterial roads including City West Link, Parramatta Road, Victoria Road (Rozelle), King Street (Newtown), Sydenham Road and King Georges Road.

As a result of the additional road network capacity provided by the project, the two-way future year average weekday traffic demand compared to a 'without project' scenario is predicted to significantly decrease on:

- City West Link and Parramatta Road at Haberfield, east of the M4 East Wattle Street and Parramatta Road ramps respectively, by about 25 per cent in the 2023 and 2033 'with project' and 'cumulative' scenarios
- King Street at Newtown by about 20 per cent in the 2023 and 2033 'with project' scenarios
- Stanmore Road at Stanmore by about 15 per cent in the 2023 and 2033 'with project' and 'cumulative' scenarios
- Lyons Road at Russell Lea by about 15 per cent in the 2023 and 2033 'with project' scenarios, and about 20 per cent in the 2023 and 2033 'cumulative' scenarios
- Southern Cross Drive and the Sydney Harbour Tunnel by about 20 per cent and 25 per cent respectively in the 2023 and 2033 'cumulative' scenarios.

The *Draft Future NSW Transport Strategy 2056* outlines a multi-modal response to addressing the transport challenges of Sydney, including a range of road/motorway, public transport and active transport projects. WestConnex is only one of many projects identified to address these transport challenges.

C3.6.2 The project would not meet the stated M4-M5 Link project objectives

Submitters raised concerns regarding the need for the project on the basis that the M4-M5 Link would not meet its project objectives. Submitters raised the following issues:

- The Rozelle interchange and Iron Cove Link would not meet the project objective of linking the M4 East and the New M5
- The Rozelle interchange would not meet its objective of reducing congestion in the surrounds of Anzac Bridge
- The Rozelle interchange does not facilitate improved connections between western Sydney and Sydney Airport and Port Botany
- The Iron Cove Link is neither viable nor necessary in achieving the objectives of the project
- It is unacceptable that the project objectives continually change as the project progresses. The objectives are unrecognisable from the initial concept
- The project would not alleviate congestion on Parramatta Road to aid its liveability for urban renewal
- Concern that the project would not achieve its objectives including traffic reduction, improved travel times, improved bus services and freight movements

- The project objectives are biased towards a motorway solution. Proposed alternatives were always analysed as falling short
- Vehicle movements at the Rozelle interchange and surrounds of Anzac Bridge would experience no improvement and may be worse than the current situation, proving that the project fails to deliver on its own objectives
- The project fails to meet its objectives because of its failure to minimise adverse social, environmental and economic impacts, including cumulative impacts at Haberfield and Ashfield
- As the project is based on a concept design it would experience problems meeting its objectives
- The project would not reduce traffic congestion as the EIS predicts that despite the building of M4 East and New M5 there would be congestion in Sydney in 2023 and 2033
- The EIS acknowledges that the project does not meets its objectives; however it also claims that the project will meet the objectives with possible future projects, but this is a statement unsupported by objective evidence
- The EIS asserts time savings and benefits unsupported by evidence
- The Rozelle interchange would not deliver its intended objectives
- The project would not reduce traffic on un-tolled roads due to the cost of tolls causing drivers to avoid the use of the project and WestConnex motorways
- The Rozelle Interchange was never part of the initial objectives. Such a big infrastructure project should not be able to just change its objectives as it goes along until the project is unrecognisable from the initial concept
- The objective of the Rozelle interchange is to enable the construction of the Western Harbour Tunnel. If the Western Harbour Tunnel is unviable, too costly, or the impacts too great and unable to be mitigated, then this changes whether the Rozelle Interchange can be justified
- M4-M5 Link fails to improve the congestion which the areas surrounding the St Peters Interchange already experiences.

Response

Objectives have been developed for the project (refer to section 3.3 of the EIS) to respond to key issues that underlie the strategic need for the project. The project objectives are consistent with the broader objectives of the WestConnex program of works, which have been developed to be aligned with the strategic objectives of national and NSW planning and policy documents. An overview of the project objectives and how the project would meet these is provided in **Table C3-1**.

Table C3-1 M4-M5 Link objectives

M4-M5 Link objectives	How the project would meet these objectives
Link the M4 East and New M5 motorways so that further benefits and opportunities of WestConnex can be realised	The project is a critical motorway link that contributes (together with the M4 East and New M5 projects) to connecting western Sydney's population and growth centres with employment and business opportunities in the Sydney CBD and the Sydney Airport and the Port Botany precinct, through a direct connection to the proposed future Sydney Gateway project at St Peters. Further detail on the opportunities provided by the project is provided in Chapter 14 (Social and economic) and Appendix P (Technical working paper: Social and economic) of the EIS.
Improve traffic conditions and reduce congestion on key arterial roads in proximity to the project	The traffic assessment undertaken for the project demonstrates that the project has the potential to reduce vehicle movements and improve travel times on Parramatta Road (east of Haberfield), Victoria Road (east of Iron Cove Bridge), City West Link, Southern Cross Drive, King Street, the Princes Highway and the A3 corridor. Further detail on traffic impacts, including improvements to road safety and travel times, is provided in Chapter 8 (Traffic and transport) and Appendix H (Technical working paper: Traffic and transport) of the EIS.

M4-M5 Link objectives	How the project would meet these objectives
Improve accessibility and reliability for commercial vehicle movement in the M4 and M5 motorway corridors to economic centres, including to the Sydney Airport and Port Botany precinct	Traffic modelling undertaken for the project shows reduced travel times are forecast on key corridors, such as between the M4 Motorway corridor and the Sydney Airport/Port Botany precinct. The modelling also found improved network productivity on the metropolitan network, with more trips forecast to be made or longer distances travelled on the network in a shorter time. Full motorway connectivity to Sydney Airport and Port Botany would be delivered by the Sydney Gateway project (currently in design development phase and subject to final business case and environmental assessment). Further detail on traffic impacts, including improvements to road safety and travel times, is provided in Chapter 8 (Traffic and transport) and Appendix H (Technical working paper: Traffic and transport) of the EIS.
Facilitate urban renewal in areas where the project would reduce traffic	By reducing traffic along Parramatta Road (east of Haberfield) the project would create an opportunity for urban renewal and liveability improvements in communities along the Parramatta Road corridor, consistent with the *Parramatta Road Corridor Urban Transformation Strategy*. A reduction in vehicles on this corridor may result in greater safety for cyclists and pedestrians, making these alternative modes of transport more desirable. The forecast reduction in daily traffic volumes on Parramatta Road would support the objectives for improved connectivity, potentially enabling public transport improvements. Further information on possible future active transport connections is provided in Appendix O (Technical working paper: Active transport strategy) of the EIS. By reducing traffic on parts of Victoria Road (east of Iron Cove Bridge) and City West Link, the project would improve connectivity for pedestrians and cyclists to locations such as The Bays Precinct and potentially enable public transport improvements on this section of Victoria Road.
Minimise impacts associated with acquisition of residential and commercial properties on communities	The project has been developed to minimise the need for surface property acquisition by designing the majority of the project to be underground, with ramps connecting to the surface (refer to Chapter 5 (Project description) of the EIS for further detail). Government-owned land has been used where possible to minimise acquisition of private property. The need to reduce these impacts has been balanced with maximising opportunities for beneficial reuse of the areas required for construction that would be surplus to the operational needs of the project. Notwithstanding this design intent, construction and operation of the project would result in temporary and permanent impacts on property. As reported in the EIS, the project would require 51 total property acquisitions. Of these properties, 26 are residential, one is mixed use and 24 are commercial or industrial land uses. Property acquisition will continue to be undertaken in accordance with the *Land Acquisition Information Guide* (Roads and Maritime 2014) and the *Land Acquisition (Just Terms Compensation) Act 1991 (*NSW) and the land acquisition reforms announced by the NSW Government in 2016 (NSW Government 2016b), which can be viewed online at the NSW Department of Finance, Services and Innovation website.[8] Refer to Chapter 12 (Land use and property) of the EIS for further details of property acquisition impacts. See **Chapter E1** (Environmental management measures) for details of the mitigation measures the project will adhere too.

[8] https://www.finance.nsw.gov.au/sites/default/files/NSW_Government_Response.pdf

M4-M5 Link objectives	How the project would meet these objectives
Enable long-term motorway network development by providing a connection to the proposed future Western Harbour Tunnel and Beaches Link project to the north	As part of the Rozelle interchange the M4-M5 Link project would construct mainline tunnel and ramp connections to the proposed Western Harbour Tunnel project and associated infrastructure to help facilitate the delivery of the Western Harbour Tunnel project, should it be approved. Further details on the infrastructure included as part of the M4-M5 Link and the timing for delivery of both projects is provided in Chapter 5 (Project description) and Chapter 6 (Construction work) of the EIS respectively.
Deliver a project with a beneficial urban design outcome	The project would provide new open space at the Rozelle Rail Yards, and a network of increased pedestrian and cycle connections, which would provide increased opportunities for the community to meet and interact. The Rozelle Rail Yards currently act as a significant physical barrier between the communities of Annandale, Rozelle and Lilyfield. The project would transform this area into public open space with a network of active transport links, which would improve social cohesion and community connectivity for the communities of Annandale, Rozelle, Lilyfield, Glebe and Balmain and provide connections to The Bays Precinct. A number of the larger arterial roads, including City West Link, Victoria Road and Parramatta Road are physical and psychological barriers between communities in the study area. The project would reduce this barrier effect by reducing traffic volumes on sections of these roads and increasing and/or improving pedestrian and cyclist networks. The active transport facilities include an upgraded pedestrian footpath and separated cycleway between Springside Street and the Bay Run at Byrnes Street, on the southern side of Victoria Road at Rozelle. This connection would assist in improving connectivity along Victoria Road, including connections to King George Park and the Bay Run. Overall, the project is expected to increase community cohesion, which is a positive urban design outcome for a large number of local residents across the study area. The future use of remaining project land would be outlined in a Residual Land Management Plan and Urban Design and Landscape Plans for the project. More information can be found in Chapter 13 (Urban design and visual amenity) and Appendix L (Technical working paper: Urban design) of the EIS.

The EIS does not state the project would not meet is objectives. An overview of the project objectives and how the project would meet these is provided in **Table C3-1.** The EIS assesses the whole project against the project objectives and not individual components of the project against individual objectives.

Linking the M4 East and New M5 motorways is only one of a number of project objectives. The Rozelle interchange and Iron Cove Link are consistent with other project objectives including improving traffic conditions and reducing congestion on key arterial roads in proximity to the project and enabling long-term motorway network development by providing a connection to the proposed future Western Harbour Tunnel and Beaches Link project to the north.

The Rozelle interchange has not been included to solely facilitate the construction of the proposed future Western Harbour Tunnel. Apart from the connection to the proposed future Western Harbour Tunnel, the Rozelle interchange tunnels would connect the mainline tunnels (via the Inner West subsurface interchange) with:

- The existing surface road network at City West Link, The Crescent and Victoria Road towards Anzac Bridge
- The Iron Cove Link, which would connect to the existing surface road network at Victoria Road near the eastern abutment of Iron Cove Bridge.

The Rozelle interchange would also improve road network connectivity to The Bays Precinct from the west and south for the project.

A potential northern extension for the project has been identified since 2014, with the *State Infrastructure Strategy Update 2014* (Infrastructure NSW 2014) identifying a 'northern extension' (which is realised for the M4-M5 Link in the Rozelle interchange) that would enable:

- A connection to the Sydney CBD via Anzac Bridge, as well as to Victoria Road
- A connection to the proposed future Western Harbour Tunnel and Beaches Link, which together with the M4-M5 Link, would create a western bypass of the Sydney CBD
- Connectivity to The Bays Precinct
- Reduction in surface traffic along Parramatta Road.

The M4-M5 Link, as a component of the WestConnex program of works, supports a coordinated approach to the management of freight and passenger movements, and is complementary to all modes of transport including road, rail, bus, ferries, light rail, cycling and walking.

As explained in the EIS, while the NSW Government is investing $41.5 billion (2016–2017 NSW Budget) in transport projects over the next four years (including roads and public transport) there are no feasible strategic public transport or freight alternatives to the project that, on their own, would meet the diverse range of needs for travel in the Sydney metropolitan area.

The EIS does not claim that the project, as part of the WestConnex program of works, would address all of Sydney's congestion problems or resolve all areas of congestion on the road network within the study area. What the WestConnex motorway would do is provide a viable alternative underground route, primarily for freight and commercial vehicles, thereby improving traffic conditions on the surface road network over the short to medium term. Ongoing network improvement strategies, and other key motorway connections, public transport projects and active transport projects would be required to address the pressures of Sydney's growing population over the longer term.

A response to concerns regarding the assessment of a concept design for the project is provided in **section C2.1.2**. The detailed design presented by the design and construction contractor(s) will need to satisfy all technical road design requirements and road functionality as described in the EIS, and to be consistent with the approved scope of the project, including the environmental management measures and conditions of approval for the project. The detailed design for the project would therefore also meet the objectives of the project, consistent with the concept design.

Evidence for time travel savings is presented in detail in Appendix H (Technical working paper: Traffic and transport) of the EIS. The traffic and transport assessment uses with WRTM which is a strategic model developed and operated by Roads and Maritime to provide a platform to understand changes in future weekday travel patterns under different land use, transport infrastructure and pricing scenarios. The traffic modelling is as accurate as possible at the time of modelling having been based on the most up to date input information available. As detailed in section 4.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS, the modelling approach and assessment has been undertaken in accordance with the Secretary's Environmental Assessment Requirements (SEARs) which outline the modelling approach to be undertaken for the assessment as well as the guidelines which the assessment needed to follow.

The WRTM toll choice assignment model was developed to test impacts of toll and infrastructure strategies and provide infrastructure project traffic forecasts. The model is designed to forecast the traffic choosing to use tolled and non-tolled routes for the representative peak and inter-peak periods of the day. The development of the model included Value of Travel Time Savings survey analysis to investigate people's willingness to pay tolls to use toll roads based on project specific market research surveys. The toll choice assignment model informed all aspects of traffic modelling for the project, including the screenline analysis. See **section C8.18.1** for further information.

C3.6.3 Objectives in relation to Sydney Airport and Port Botany are not met

Submitters raised concerns that the project and WestConnex would not support the objectives relating to Sydney Airport and Port Botany. Specific concerns include:

- The project does not provide a fast, direct or safe connection to Port Botany for freight or a design solution for Sydney Airport

- The project does not meet the original mandate and objective of the project in connecting Parramatta to Sydney Airport and Port Botany.

Response

As part of the WestConnex program of works, the project would facilitate improved connections to the St Peters interchange, improving connections between western Sydney and Sydney Airport and Port Botany, as well as providing better connectivity between key employment hubs and local communities. Full motorway connectivity to Sydney Airport and Port Botany would be delivered by the Sydney Gateway project (currently in design development phase and subject to final business case and environmental assessment).

Section 8.3.4 of the EIS predicts the transport related outcomes of the project in 2033. Once the entire WestConnex motorway, including the M4-M5 Link, is operational, traffic forecasting shows reductions in peak period travel times between the M4 corridor and the Sydney Airport/Port Botany precinct, with traffic shifting from the A3 corridor (King Georges Road) to the M4-M5 Link. These changes in peak period travel times include:

- Between Parramatta and Sydney Airport, average peak period travel times are forecast to reduce by about 10 minutes. This saving is part of a 30 minute saving comparing the 2033 'with project' scenario to a scenario without the preceding WestConnex stages (M4 East and New M5 projects)
- Between Burwood and Sydney Airport, average peak period travel times are forecast to reduce by about five minutes. This saving is part of a 20 minute saving comparing the 2033 'with project' scenario to a scenario without the M4 East and New M5 projects
- Between Silverwater and Port Botany, average peak period travel times are forecast to reduce by about 10 minutes. This saving is part of a 20 minute saving comparing the 2033 'with project' scenario to a scenario without the M4 East and New M5 projects.

C3.7 Benefits of the project

375 submitters raised issues regarding the benefits of the project. Benefits of the project are discussed in section 3.4 of the EIS.

C3.7.1 Who benefits from the M4-M5 Link project?

Submitters questioned who the M4-M5 Link would benefit. In particular the following issues were raised:

- A small proportion of the NSW population would use the M4-M5 Link
- Those that stand to benefit most from the project (people passing through affected areas) are not those that face the impacts of the project being implemented. People living in the affected areas derive no benefit, they merely suffer the negative effects
- The project would benefit companies/people with vested interests, including foreign construction companies, toll operators and politicians, not the community
- The key people who would benefit from the project (long distance, freight, businesses) represent a small minority of those who are forecast to use the project (single occupancy commuter vehicles)
- The project only benefits the private sector, not the public
- Developers will be the main benefactors of the project, not the residents of Sydney
- The project is for the benefit of the north-south connections to the northern beaches or the proposed new harbour tunnel and would not benefit people in the western suburbs (Emu Plains, Penrith, Mt Druitt, Blacktown, Wetherill Park)
- The project does not benefit the local community who bear the greatest cost of the construction impacts
- Residents in the vicinity of the Darley Road civil and tunnel site would not benefit during either construction or operation.

Response

Key user groups that are reliant on road based travel, and as such are likely to benefit most from the WestConnex motorway, including the project, are broadly identified as:

- International gateway users (to and from Sydney Airport and Port Botany)
- Heavy and light freight industries
- Dispersed and long distance travellers
- Commercial services and business users.

Anticipated daily traffic volumes for the project include between 61,400 and 88,800 vehicles per day in 2023 and between 70,000 and 99,400 vehicles per day in 2033 (refer to Table 9-1 and Table 9-5 of Appendix H (Technical working paper: Traffic and transport) of the EIS. The project would benefit commuter, freight and commercial vehicle traffic using the M4-M5 Link as well as other motorists who would benefit from reduced traffic on surface roads.

The development of the project would have unavoidable impacts (associated with, for example, property acquisition, construction impacts from heavy vehicle traffic, noise, vibration and dust, access disruptions and visual impacts) and in some areas, reduced road capacity and travel times, which would be managed by robust environmental management measures (see **Chapter E1** (Environmental management measures)). However overall, the project would deliver a large number of benefits. It is acknowledged that construction impacts, while temporary, are not short term, and that communities, including those near the Darley Road civil and tunnel site (C4), would be impacted over a period of a number of years. It should be noted that spoil haulage hours at Darley Road have been reduced to standard construction hours only in response to community feedback. While every effort would be made to mitigate construction and operation impacts as far as is practicable, some impacts would be unavoidable. The need for the project, as part of the broader WestConnex program of works, is justified based on the long term benefits of the project (see **section C3.7.2**).

The local community and residents would benefit from the new infrastructure, due to a decrease in surface road traffic (and therefore reduced traffic noise, congestion and improved air quality). Residents near Darley Road would benefit from reduced traffic along City West Link. Traffic modelling undertaken for the project shows that around 100,000 vehicles would use the project each day in 2033. This would free up space on surface roads, which may create opportunities for dedicated public transport lanes for buses and light rail. Motorists in the inner west LGA would experience a 11 to 12 per cent reduction in daily VKT, a 20 to 21 per cent reduction in daily VHT and a 10 to 14 per cent improvement in daily average speeds on non-motorway links (refer to Table 10-2 and Table 10-4 of Appendix H (Technical working paper: Traffic and transport) of the EIS).

Around Darley Road it is acknowledge that the project would result in impacts during construction. During operation, daily traffic volumes around Darley Road are predicted to:

- Increase marginally (around 1 per cent) on Darley Road
- Reduce significantly (around 20 per cent) on City West Link
- Reduce significantly on Norton Street (around 25 per cent), Balmain Road (around 20 per cent) and Marion Street (around 40 per cent).

The M4-M5 Link project would directly provide up to 10 hectares of new open space at the Rozelle Rail Yards, and a network of increased pedestrian and cyclist connections, which would provide increased opportunities for the community to meet and interact. The Rozelle Rail Yards currently act as a significant physical barrier between the communities of Annandale, Rozelle and Lilyfield. The project would transform this area into public open space with a network of active transport links, which would improve social cohesion and community connectivity for the communities of Annandale, Rozelle, Lilyfield, Glebe and Balmain.

A number of the larger arterial roads, including City West Link, Victoria Road and Parramatta Road are physical and psychological barriers between communities in the local area. The project would reduce this barrier effect by reducing traffic volumes on sections of these roads and increasing and/or improving pedestrian and cyclist networks at Rozelle and Iron Cove. At Iron Cove, the active transport facilities include an upgraded pedestrian footpath and separated cycleway between Springside Street and the Bay Run at Byrnes Street, on the western side of Victoria Road at Rozelle. This connection would assist in improving connectivity along Victoria Road, including connections to King George Park and the Bay Run.

Overall, the project is expected to increase community cohesion, which is a positive urban design outcome for a large number of local residents across the local area.

The *Transport Master Plan* identified that western Sydney is currently home to 47 per cent of Sydney's residents but only 37 per cent of Sydney's jobs (Transport for NSW 2012). Therefore, a link between western Sydney and other centres in Sydney such as the Sydney CBD, Sydney Airport and Port Botany is required to provide access from western Sydney to key employment areas. These connections are required to allow not only for the flow of workers, but also for the effective flow of goods and freight which can only occur by road transport, as rail transport does not provide point-to-point access to individual homes, warehouses, industrial warehouse and or commercial premises. By improving connectivity and enhancing the flow of people and goods to Sydney's southwest, the project would also encourage business and industry investment and, as a result, employment opportunities, in southwest centres.

C3.7.2 Project would not provide stated benefits

Submitters queried whether the benefits stated in the EIS would actually be created. In particular submitters were concerned with the following:

- Do not believe the project would deliver the benefits identified in the EIS
- The claim that the M4-M5 Link is a critical part of WestConnex, allowing its full benefits to be realised, is not supported by the EIS
- The link between the M4 and M5 motorways does not offer any obvious benefits considering this link duplicates the existing A3 corridor
- Unsure if the project especially the tunnel at Iron Cove [the Iron Cove Link] would provide the stated benefits
- The increase in traffic on Parramatta Road as a result of reinstated tolls on the widened section of the M4 Motorway creates doubts about the benefits of the M4-M5 Link
- Stated travel time improvements would not be realised
- Roads and Maritime and the NSW Government has falsified the benefits of tunnels
- The reduction of traffic on Victoria Road is not a benefit because the area has not been classified for redevelopment.

Response

By providing a motorway link between the M4 East at Haberfield and the New M5 at St Peters, the project would help to connect major employment centres, which are critical in supporting the creation of jobs and businesses. This would include centres within the 'global economic corridor', which includes the Sydney Airport and Port Botany precinct, Parramatta CBD, Sydney CBD as well as Sydney Olympic Park. The project would also support the Western Sydney Employment Area (which is outside the global economic corridor) by providing a motorway connection via the M4, M7 and proposed M12 motorways or via the M7 and proposed M12 motorways.

The benefits provided by the project as part of the WestConnex program of works include:

- Ease congestion on surface roads by providing an underground motorway alternative and allowing for increased use of surface roads by pedestrians and cyclists and for public transport
- Reduce through traffic on sections of major arterial roads including City West Link, Parramatta Road, Victoria Road, King Street, King Georges Road and Sydenham Road, facilitating urban renewal opportunities to be realised along parts of the Parramatta Road and Victoria Road corridors
- Improve network productivity on the metropolitan network, with more trips forecast to be made or longer distances travelled on the network in a shorter time. The forecast increase in VKT and reduction in vehicle hours travelled is mainly due to traffic using the new motorway, with reductions in daily VKT and reduction in VHT also forecast on non-motorway roads
- Reduce travel times on key corridors, such as between the M4 Motorway corridor and the Sydney Airport/Port Botany precinct and between the main centres on the Global Economic Corridor, including Sydney CBD, Sydney Olympic Park and Parramatta CBD

- Facilitate future growth in Sydney's transport network by allowing for connections to the proposed future Western Harbour Tunnel and Beaches Link and Sydney Gateway projects.

Benefits forecast for the Sydney metropolitan road network are outlined in detail in Appendix H (Technical working paper: Traffic and transport) of the EIS.

As part of M4-M5 Link, the following open space improvements will be created:

- Deliver up to 10 hectares of new open space at the Rozelle Rail Yards which would provide an open space link between Bicentennial Park at Glebe and Easton Park at Rozelle
- Around 2.5 hectares of open space at St Peters.

Opportunities are being explored to create new open space connections along Victoria Road as part of the Iron Cove Link component of the project.

The cost benefit analysis for the M4-M5 Link calculated the BCR for the project as $2.38 or $2.94 with wider economic benefits. Further detail regarding the cost benefit analysis of the project is provided in **section C3.3.3**.

Investment in the M4-M5 Link, together with the other WestConnex component projects, would assist in facilitating the delivery of other major city-shaping improvements, such as outlined in the Parramatta Road Corridor Urban Transformation Strategy and The Bays Precinct Transformation Plan, which would all contribute to delivering economic growth. As part of the broader WestConnex program of works, the project would support NSW's major sources of economic activity and provide a strategic response to the future transport demands on the already congested road network, which includes the A3 corridor.

The project provides a number of benefits compared to using the A3 corridor including the avoidance of traffic congestion, slow travel times, stop/start traffic, and a number of signalised intersections along the A3 route.

The transfer of traffic from the M4 Motorway to Parramatta Road after the reintroduction of tolls was forecast in the traffic modelling for both the M4 Widening and M4 East EISs. It is predicted there would be a shift in traffic from Parramatta Road back to the motorway once M4 East construction is complete and it is open to traffic in 2019.

The provision of the Iron Cove Link would provide the following benefits:

- Reduce traffic on Victoria Road (east of Iron Cove Bridge)
- Improve some journey times for buses along parts of the Victoria Road corridor
- Provide the option to bypass five sets of traffic lights up to the intersection with City West Link
- Allow for improved public transport services and urban amenity associated with the reduction of surface traffic on this section of Victoria Road.

Tunnels provide a range of benefits in constrained urban environments including reducing surface construction impacts, reducing the need for property acquisition and providing an alternative to the surface road network, bypassing intersections and at-grade crossings.

The reduction of traffic on Victoria Road is considered to be a benefit in its own right in addition to the associated benefits of allowing for improved public transport services and urban amenity, north-south connectivity. The benefits of the project do not relate solely to the potential for urban development/redevelopment in proximity to the project.

C3.7.3 Support of the project benefits stated in the EIS

A submitter noted that they could understand the full benefits of the M4-M5 Link project and the way it would connect communities.

Response

Support for the project is noted.

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C4 Project development and alternatives

This chapter addresses issues raised in community submissions associated with the project development and alternatives of the M4-M5 Link project as described in the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 4 (Project development and alternatives) of the EIS for the further details on the project development and alternatives.

Contents

C4.1 Existing arterial road network strategic alternatives

107 submitters raised concerns about the strategic alternatives for the existing arterial road network. Refer to section 4.4 of the EIS for details of Alternative 1 – improvements to the existing arterial road network.

C4.1.1 Improvements to the existing arterial road network

Submitters raised concerns that improvements to the existing arterial road network would be a better investment instead of the M4-M5 Link project. Specifically, submitters raised the following issues with respect to improving the existing arterial road network as an alternative to the project:

- Improvements to the existing road network as a project alternative were not adequately assessed
- Use the existing road network to link and better connect the M4 East and Parramatta Road corridor with the New M5/M5 East
- Upgrading the M7 Motorway, A6 and A3 corridors is a preferred alternative to the project for cost and time efficiencies between the M4 and M5 motorways, especially as their alignments would service multiple demand corridors
- Upgrade the A3 corridor to link the M4 and M5 motorways and to connect into the city
- Upgrade the existing City West Link to Wattle Street interchange
- Upgrades to the existing Eastern Distributor and Cross City Tunnel would be sufficient to improve Sydney's traffic conditions
- Provide a possible connection between City West Link and the Cross City Tunnel to bypass Anzac Bridge
- Upgrades to the regional road network
- Upgrade the Sydney Coordinated Adaptive Traffic System to improve signal phasing
- Local tunnel or subway solutions to decongest inner city areas and redirect car flow out of the Sydney central business district (CBD)
- Improvements to ring roads in western Sydney
- It may be more effective and cheaper to invest in small scale engineering improvements on existing roads such as traffic light coordination, better intersection design and smaller scale streamlining of roads
- A bypass four lane two way tunnel should be constructed under Victoria Road (portal at Quirk Street, Rozelle) and located on reclaimed land to the south. This would allow the heavy/light rail corridor to be retained.

Response

A range of alternatives to the M4-M5 Link were considered to identify the extent to which they could meet the project objectives (refer to section 3.3 of the EIS for the project objectives) and how well they performed with reference to other transport, environmental, social and economic factors. Improvements to the existing arterial road network as an alternative to the project is described in section 4.4.1 of the EIS.

Ongoing improvements to the broader transport network are planned or underway (such as NSW Roads and Maritime Services (Roads and Maritime's) 'Easing Sydney's Congestion' initiatives) including some new infrastructure and intersection improvements to improve capacity and cater for traffic growth.

There are no existing arterial roads that would directly link the M4 East Motorway at Haberfield with the New M5 Motorway at St Peters, both of which are currently under construction. The M4-M5 Link would provide both an east-west connection towards Anzac Bridge and the Sydney CBD, and a north-south connection toward St Peters. In addition, the project would enable long-term motorway network development by providing a connection to the proposed future Western Harbour Tunnel and Beaches Link project to the north. Together with the other components of the WestConnex program of works the project would facilitate improved connections between western Sydney (including the Parramatta Road corridor) and south and south-western Sydney (including the M5 South Western Motorway).

In the absence of the project, motorists using the M4 East and New M5 motorway tunnels wishing to travel north or south would be required to travel along existing local and sub-arterial roads or traverse the Sydney CBD to access existing key north–south corridors such as the M1 Motorway. Examples of existing routes that would provide connectivity to the north and south (as an alternative to the project) could include Parramatta Road, City Road/King Street/the Princes Highway, King Georges Road, M1 Motorway/Anzac Bridge/City West Link, Johnston Street/The Crescent, Edgeware Road, Shaw Street and Norton Street, as well as the local road network. The connectivity between the M4 East and the New M5 motorways provided by these routes is indirect and requires motorists to travel through many at-grade intersections and, in some cases, steep grades such as on parts of King Georges Road, or congestion and high pedestrian traffic such as on King Street at Newtown, which are not appropriate for freight vehicles.

Continued urban development along the Parramatta Road and Victoria Road corridors has resulted in limited capacity for widening and/or upgrades to these roads. Limited road reserves would mean that any future improvements to the surface road network would not be able to proceed without considerable challenges, including the acquisition of a large number of properties. Even if arterial road upgrades could be achieved at reasonable cost and impacts, the improvements are unlikely to match the capacity that would be provided by the project; hence the potential benefits to motorists would be limited in the longer term. As such, improvements to the arterial road network alone are not a feasible or long-term alternative to the project.

Improvements to the road network through these corridors, as an alternative to the project, would require significant upgrades (eg road widening or road closures) and the implementation of traffic controls (eg clearways) to accommodate projected traffic volumes. Improvements to the existing arterial road network would:

- Result in potentially significant community and environmental impacts through increased traffic flows within residential areas leading to increased noise and detrimental air quality, and potential property acquisition impacts associated with road upgrades
- Make it difficult to achieve land use regeneration and urban renewal along parts of Parramatta Road or along Victoria Road (east of Iron Cove Bridge), or to upgrade public transport services along these corridors, as proposed by the NSW Government
- Not provide the future connectivity to Sydney's international gateways at Sydney Airport and Port Botany through the St Peters interchange and the proposed future Sydney Gateway project
- Not enable direct and free flow connections to the proposed future Western Harbour Tunnel and Beaches Link program of works and F6 Extension project to provide a western bypass of the Sydney CBD.

Arterial road improvements alone would therefore not meet the project objectives. In order to improve the capacity and performance of the arterial road network across the Sydney metropolitan area, Roads and Maritime would continue to implement projects in addition to the M4-M5 Link, such as the Easing Sydney's Congestion program.

The Sydney Coordinated Adaptive Traffic System is an adaptive urban traffic management system that synchronises traffic signals to optimise traffic flow. Similar to other components of the arterial road network, improvements to the system would only provide incremental change in the efficiency of the road network, and would not support the additional capacity required for regional traffic growth outlined above.

Alternative – upgrade the A3 corridor including King Georges Road

The A3 corridor between the Hume Highway and the M5 Motorway is bordered by predominantly private residences, with many homes sited close to the road, and with clusters of businesses in some suburbs. Grade separation may result in potential visual impact issues and requires more land than at-grade intersections, which would require the acquisition of businesses and homes around each intersection. There are two grade separated and 17 signalised intersections along the A3 corridor between the M4 and M5 motorways. Heavy congestion on the corridor during peak periods reduced average travel speeds to around 25 kilometres per hour in 2015.

It would not be feasible to grade separate each intersection and therefore stop-start traffic at signalised intersections would continue. In general, adding to the number of heavy vehicles along this already busy corridor would reduce amenity for homes, schools (such as Wiley Park Public School), businesses and pedestrians and re-create the poor amenity experienced on Parramatta Road by the impact of congested traffic and high number of heavy vehicles.

In addition, the corridor is an important transit corridor for buses and any upgrades would need to consider the needs of buses and their ability to pull into and out of bus stops without conflicting with heavy vehicles.

One of the key advantages of the M4-M5 Link is that traffic, particularly heavy vehicle traffic, would be removed from the surface roads so that air quality, amenity and safety is improved for people living and working along surface routes such as the A3 corridor, and secondly, that travel would be more efficient in a tunnel, without intersections.

Alternative – upgrade other sections of existing motorways and arterial roads (eg Eastern Distributor, M7 Westlink and City West Link)

Similar to the alternative of upgrading the A3 corridor outlined above, upgrades to surface roads such as the Eastern Distributor, M7 Westlink, City West Link or similar would be constrained by at-grade intersections and the requirement for significant property acquisitions due to the need for road widening in a constrained urban environment. Upgrades to these roads would not remove traffic from surface roads.

The M7 Motorway primarily serves Sydney's west and was developed to respond to a need to connect the M2, M4 and M5 motorways, complete a substantial part of the NSW Government's Sydney Orbital Strategy and reduce travel times across western Sydney. Although the M7 Motorway performs an important north-south connection function in Sydney's strategic road network, given its location in western Sydney, the M7 Motorway is not an alternative to the project, with both the M7 Motorway and the M4-M5 Link necessary to facilitate efficient movement of dispersed freight and commercial movements, as well as longer distance recreational trips.

These upgrades would also not provide a bypass of the Sydney CBD nor provide the required link between the M4 East and New M5 motorways to realise the full benefits and opportunities of WestConnex. The WestConnex program of works has been developed to provide an integrated transport network solution as part of the NSW Government's long-term, integrated transport and land use planning solution, recognising that the constraints on the current M4 Motorway and the M5 East Motorway cannot be resolved in isolation from each other. The M4-M5 Link would be a direct link between the M4 East and New M5 motorways, and would allow for higher capacity travel and reduced travel times without traffic lights along the WestConnex motorways network.

The M4-M5 Link project, as part of a completed WestConnex program of works and the proposed future Western Harbour Tunnel project, would provide a western bypass of the Sydney CBD, alleviating pressure on existing north−south corridors including the Southern Cross Drive, A1 (the Princes Highway) and A3 (Centenary Drive/Roberts Road/King Georges Road) and the Sydney orbital network, as well as reducing traffic volumes on the Sydney Harbour Bridge and Sydney Harbour Tunnel.

Alternative – direct connection to the Cross City Tunnel

The project would not preclude the provision of connections to the Cross City Tunnel as an alternative to Anzac Bridge as part of a separate project in the future.

In order to address concerns regarding existing and predicted congestion on Anzac Bridge as a result of the project, operational reviews of the surrounding network performance will be undertaken. As with the M4 East and New M5 projects, Roads and Maritime would undertake a Road Network Performance Review, in consultation with Transport for NSW and relevant councils. This would confirm the operational traffic impacts of the M4-M5 Link on surrounding arterial roads and major intersections at both 12 months and five years after opening of the project. The assessment would be based on future updated traffic surveys taken during operation utilising an appropriate methodology following the relevant and industry accepted guidelines current at the time. Regardless, those areas that have been identified as being potentially impacted by the project have been identified in Appendix H (Technical working paper: Traffic and transport) of the EIS and would be addressed prior to these operational reviews, or as needed.

Roads and Maritime will develop a strategy to ensure appropriate network integration in the areas surrounding the Rozelle interchange. The strategy will include a review of:

- Capacity improvement measures
- Project staging options
- Demand management measures.

C4.2 Public transport strategic alternatives

1,367 submitters raised concerns about the consideration of public transport strategic alternatives. Refer to section 4.4 of the EIS for details of Alternative 2 – investment in alternative transport modes.

C4.2.1 Public transport strategic alternatives and assessment

Submitters raised concerns that funding would be better invested in a reliable integrated public transport system instead of the project. Submitters raised the following issues with respect to public transport alternatives:

- Public transport is a better solution to solve traffic congestion, is more sustainable and more affordable
- Funding should be spent on innovative, technology driven, frequent and interlinked, fixed capacity, high speed public transport
- Other global cities are investing in fast and efficient public transport
- Sustainable public transport alternatives should be being pursued by the NSW Government
- Commuters, particularly from western Sydney, would avoid toll roads, and would prefer to take public transport if it were available
- Removal or reduction of fees for public transport would reduce traffic congestion and encourage use
- High speed rail links and light rail alternatives would remove congestion on roads, particularly between western Sydney and Sydney's various CBDs, and along Parramatta Road
- Free shuttle buses should be investigated which can assist in transporting commuters from outer city car parks to the public transport hubs
- Increases in the number of buses in the network and implementation of delegated bus lanes on existing roads to be considered
- Public transport is required to service the needs of non-commercial traffic and cross suburban movements
- Anzac Bridge should be converted to service public transport, not private vehicles. A bus lane on the eastbound side of Anzac Bridge should be considered to prioritise public transport users over private vehicles
- An alternative rail solution to relocate the Sydney Metro to an elevated train route from St Peters to Liverpool and to northwest Sydney via Victoria Road

- Underground public transport is a preferable solution. The footprint of WestConnex is larger compared to the footprint that would be required for underground rail
- Mass transit options should be integrated into the existing fabric of Sydney
- A train service to the airport should be priority from areas all over Sydney
- Upgrading and extending the passenger train service alternative for Western Sydney was dismissed with reference to a scoping study. This study should have been done before WestConnex was considered
- Concern the option of public transport has not been adequately considered
- An equally large public transport project would also create a similar number of jobs and far more ongoing operational jobs.

Submitters also raised concerns that public transport alternatives were not assessed as part of the M4-M5 Link. Submitters raised the following issues with respect to the assessment of public transport alternatives:

- Public transport should be examined more fully and transparently
- Rail options were not adequately assessed
- The assessment of public transport alternatives does not satisfy the Secretary's Environmental Assessment Requirements (SEARs) for the project
- A comparative cost-benefit analysis was not undertaken for public transport and freight alternatives.

Response

The EIS was prepared in accordance with the relevant provisions of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). It was prepared to address the SEARs and the relevant provisions of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (NSW). Consideration of the project against a range of other strategic alternatives has been undertaken in accordance with the SEARs and is presented in section 4.4 of the EIS.

The SEARs for the project required that the EIS contain an analysis of the feasible alternatives to carrying out of the project, including an analysis of the alternatives/options considered, having regard to the project objectives. As such, any strategic alternatives were required to be considered in terms of the project objectives as outlined in Chapter 3 (Strategic context and project need) of the EIS. The consideration of public transport alternatives is described in section 4.4.2 of the EIS.

The *NSW State Infrastructure Strategy 2012-2023* (Infrastructure NSW 2012) states that, based on the economic and demographic forecasts, public transport is expected to experience strong growth, particularly around the Sydney CBD and other business centres. The Strategy also notes that the key challenges facing urban public transport relate to the following:

- The ability of the existing public transport network to serve a growing population while providing the mobility and connectivity necessary to sustain economic growth and productivity
- Improving access to the Sydney CBD
- Supporting growth in Sydney's emerging centres
- Optimising the performance of the existing public transport network
- Building future network capacity that keeps pace with demand and meets the needs of businesses and households.

While the use of public transport is expected to grow with the implementation of key public transport initiatives, most growth in transport demand over the next 20 years will continue to be met by roads.

Public transport is best suited to providing concentrated, high volume flows of people to and from established centres. It is less suited to providing dispersed cross-city or local trips. In 2014, around 17.6 million trips were made each average weekday in Sydney, with around 75 per cent of these by road. To meet this demand, the NSW Government is investing $41.5 billion (2016–2017 NSW Budget) in transport projects over the next four years (including roads and public transport). Sydney Metro West is one of the key public transport projects in the early planning phase, which would be a largely underground railway line between Sydney CBD and Parramatta. However, even with significant investment and high levels of patronage growth forecast for Sydney's public transport network, about 72 per cent of around 27.5 million journeys in 2031 are expected to be made on the road network each weekday by private vehicles, equal to an additional 4.3 million new trips compared to 2014 (Infrastructure NSW 2014).

Employment growth in the Sydney metropolitan area is expected to increase in keeping with a growing population. While Sydney has an extensive public transport network (with rail being the most popular mode used to access the Sydney CBD), the level of service can vary significantly. A key constraint to the expansion and development of the rail network is Sydney's geography, with large parts of the Sydney metropolitan area, such as outer western Sydney and the Northern Beaches region, being relatively poorly connected by public transport to Sydney's global employment centres. As major rail projects have a long lead time, the focus in the shorter term is to improve public transport services through the bus network, such as bus priority programs and bus rapid transit.

With about 60 per cent of employment dispersed across the Sydney metropolitan area, public transport alone cannot viably serve most of these locations. Even under the most ambitious scenarios for land use change and growth in public transport, the absolute number of car journeys will continue to increase (Sydney Motorway Corporation 2015a).

Public transport improvements alone are therefore not a viable alternative to meeting the project objectives. Investment in integrated transport solutions that involve both roads and public transport is needed to cater for the concentrated population growth forecasts and associated increase in travel movements.

The M4-M5 Link, as a component of the WestConnex program of works, supports a coordinated approach to the management of freight and passenger movements, and is complementary to all modes of transport including road, rail, bus, ferries, light rail, cycling and walking. There is, however, recognition that Sydney's freight, commercial and services tasks require distribution of goods and services across the Sydney basin, which relies on more diverse and dispersed point-to-point transport connections that can only be provided by the road network.

In addition, by reducing surface road traffic along sections of Parramatta Road and Victoria Road, the project would facilitate potential improvements in public transport, such as on-street rapid transit, by either bus or light rail, and support the expansion of the active transport network. Public transport improvements on these key transport corridors are highlighted in the *Draft Future Transport Strategy 2056* (Transport for NSW 2017).

The project offers a flexible design which does not preclude bus priority measures being included in the future, including along Victoria Road and Anzac Bridge.

Together with the WestConnex program of works and the proposed future Sydney Gateway project, the project would facilitate improved connections between western Sydney and Sydney Airport and Port Botany (via the St Peters interchange), and south and south-western Sydney, as well as better connectivity between the important economic centres along Sydney's Global Economic Corridor and local communities. Connections to Sydney Airport from other areas within Sydney are beyond the scope of the project. The reference to the Western Sydney Rail Needs Scoping Study in Table 4-2 of the EIS was to identify key rail projects that are under construction or have been announced. The potential for investment in rail in western Sydney was considered in the assessment of strategic alternatives for passenger rail services and rail freight services.

Concerns regarding the business case and cost benefit analysis for the project are addressed in **section C3.3**.

C4.2.2 Integrate M4-M5 Link with public transport

Submitters raised concerns that integrating the project with public transport was not assessed and that this would be a better investment. Submitters raised the following suggestions for public transport to be integrated with the M4-M5 Link:

- Dedicated bus lanes
- Heavy rail above ground, or underground in the same tunnelling system
- Light rail
- The design has not accounted for increased patronage of public transport or provision for future public transport options.

Response

The M4-M5 Link project has been designed to integrate with public transport as described in sections 5.6.7 and 5.6.8 of the EIS.

The NSW Government is investigating a number of public transport initiatives in and around Rozelle. This includes Sydney Metro West, indented bus bays along Victoria Road and public transport connections as part of The Bays Precinct transformation. Roads and Maritime is having ongoing discussions with UrbanGrowth NSW, Transport for NSW and Inner West Council, on ways to optimise connectivity with the M4-M5 Link.

The realignment of The Crescent would include a new pedestrian connection to the Rozelle Bay light rail stop. The new pedestrian and cyclist bridge that would span City West Link and that would connect The Crescent with the Rozelle Rail Yards would also include a new pedestrian and cyclist connection to the Rozelle Bay light rail stop. The project would not affect the existing connection to the Rozelle Bay light rail stop from Bayview Crescent at Annandale. Existing access to the light rail stop at Leichhardt North and bus stops on Victoria Road and The Crescent would be maintained.

The project offers a flexible design which does not preclude bus priority measures being included in the future, including along Victoria Road and Anzac Bridge. Roads and Maritime and Transport for NSW will continue to work together to deliver Sydney's Bus Future, which may be extended to the area around the Rozelle interchange, at which point the surface road network can be adapted to include the measures identified, at a future date.

In addition, by reducing surface road traffic along sections of Parramatta Road and Victoria Road, the project would provide an opportunity for potential future developments in public transport and support the expansion of the active transport network to achieve the sustainability and liveability objectives of the WestConnex program of works. This could include development of on-street rapid transit, by either bus or light rail, between Burwood and the Sydney CBD along the Parramatta Road corridor.

While public transport, integrated transport and land use planning is part of the vision for future transport in Sydney (as documented in the *Draft Future Transport Strategy 2056*), not all trips across Sydney can be served by public transport. The M4-M5 Link, as a component of the WestConnex program of works, supports a coordinated approach to the management of freight and passenger movements, and is complementary to other transport modes including public transport projects such as the proposed Sydney Metro West, which would link the Parramatta and Sydney CBDs through an underground metro railway line. Public transport strategic alternatives are discussed in **section C4.2.1** and section 4.4.2 of the EIS.

C4.3 Active transport strategic alternatives

43 submitters raised concerns about the consideration of active transport strategic alternatives. Refer to section 4.4 of the EIS for details of Alternative 2 – investment in alternative transport modes

C4.3.1 Active transport alternatives and assessment

Submitters objected to the lack of consideration of active transport alternatives to the project. Submitters made the following suggestions in particular:

- Increase development of cycle and pedestrian paths in general
- Incorporate more bicycle lanes on existing road networks

- Undertake cycleway improvements as a related but separate project
- Active transport such as cycle and pedestrian paths should be key elements in the planning of the project
- Table 4-3 of the EIS gives a description of active transport initiatives and improvements outside of the project scope (Parramatta Road, Greenway etc.). It was considered that these initiatives should be integrated into the project
- The inner west needs a safe bike lanes and safe pedestrian footpaths, so people can ride safely to and from transport hubs and places of education, business, work and recreation.

Submitters also raised concerns regarding the lack of assessment in the EIS of active transport alternatives to the project.

Response

Active transport improvements are regarded as complementary to other transport modes including roads and public transport. They are an essential component of an integrated transport solution, meeting the needs of local communities and shorter distance commuters.

The M4-M5 Link project includes new and improved active transport links in a number of locations, generally associated with surface works and/or residual land for the project (as described in Chapter 5 (Project description) of the EIS). Active transport links will improve connectivity between communities, open space areas, public transport modes and the existing active transport network. The new links will also provide improved amenity and safety for pedestrians and cyclists when compared to the existing network.

Indicative active transport being delivered as part of the project is listed in **Table C4-1**.

The active transport links would maintain and enhance the links between communities on either side of the interchanges for the project. Active transport being delivered as part of the project would be complemented by other active transport projects being delivered separately by others as summarised in Table 7-1 of Appendix N (Technical working paper: Active transport strategy) of the EIS.

Table C4-1 Indicative active transport links being delivered as part of the project

Route	Benefits	Type	Approximate length
Rozelle Rail Yards Link Links the Bay Run, The Bays Precinct and the GreenWay in the west to Anzac Bridge and the Sydney CBD in the east	Links Anzac Bridge through The Bays Precinct to Lilyfield Road at the western end of the Rozelle Rail Yards[1]	Separated cycle path	250 metres
	Provides the junction connecting Rozelle Rail Yards and Victoria Road to The Bays Precinct	Underpass	150 metres
	Provides the link between Victoria Road and the CBD and South East Light Rail Rozelle Maintenance Depot	Separated cycle path	1,000 metres
Victoria Road – Iron Cove Link Links the northern suburbs of Drummoyne and Russell Lea and Chiswick to The Bays Precinct and the Sydney CBD	Connecting the eastern side of the Rozelle Rail Yards along Victoria Road to the intersection of Robert Street	Separated cycle path	250 metres
	Linking the intersection of Springside Street to Iron Cove Bridge and the Bay Run	Separated cycle path	450 metres
	Connecting Victoria Road to The Crescent over the Rozelle Rail Yards	Bridge	200 metres
	Connecting Victoria Road to The Crescent	Shared path	400 metres
	Connecting The Crescent to James Craig Road existing active transport network	Shared path	500 metres
Whites Creek Link Links Parramatta Road to the Rozelle Yards and onto Callan Park	Linking the intersection of Brenan Street and Railway Parade over City West Link connecting to the Rozelle Rail Yards Link	Bridge	200 metres
Johnston Creek Valley link Extends the existing Johnston Creek pathway to connect Glebe Foreshore to Parramatta Road	Connecting Easton Park to The Crescent through the Rozelle Rail Yards	Bridge/shared path	300 metres
	Providing a suitable cycling space for the connection along The Crescent, into Jubilee Park and linking the existing Glebe Foreshore	Shared path	500 metres

Note:
1 This component would be delivered by the M4-M5 Link and UrbanGrowth NSW.

The final design of the active transport links to be delivered by the project would be subject to detailed design and in accordance with Urban Design and Landscape Plans (UDLPs) that would be prepared for the project. UDLPs would be prepared in consultation with stakeholders and the community and would be exhibited for public comment prior to the commencement of permanent built surface works and/or landscape works. The aim of the UDLPs is to present an integrated urban design for the project.

An Active Transport Network Implementation Strategy will be prepared for the project (see **Chapter E1** (Environmental management measures)). The strategy will be consistent with Appendix N (Technical working paper: Active transport strategy) of the EIS.

Active transport to be provided by the project would be developed in consideration of other plans for active transport improvements in the area, including active transport improvements associated with the *Parramatta Road Corridor Urban Transformation Strategy*, *The Bays Precinct Transformation Plan* and various council initiatives such as Greenway, The Green Grid and the Lilyfield Road regional bike route. Table 4-3 in section 4.4.2 of the EIS describes the active transport initiatives and improvements outside of the project scope that have been considered in preparation of the Active transport strategy.

In addition to the active transport routes to be delivered as part of the project, a number of other routes were identified, which may be delivered by other parties, as listed in Chapter 7 of Appendix N (Technical working paper: Active transport strategy) of the EIS.

C4.4 Freight strategic alternatives

23 submitters raised concerns about the consideration of freight strategic alternatives. Refer to section 4.4.2 of the EIS for details of the Alternative 2 – investment in alternative transport modes

C4.4.1 Freight alternatives and assessment

Submitters raised concerns that funding would be better invested in rail freight instead of the project. Submitters raised the following for investment in freight over the project:

- Invest in rail freight options, including high speed rail and the Maldon to Dombarton freight line, instead of the project
- Invest in improving freight movements to/from the port to the airport. Rail transport is the preferred means for transporting containers goods to/from Port Botany and Sydney Airport
- Invest in improving rail freight connections to regional cities.

Submitters also raised concerns regarding the lack of content in the EIS relating to the assessment of rail freight alternatives, including that the EIS did not adequately address the SEARs in relation to the assessment alternative freight options.

Response

The SEARs for the project required that the EIS contain an analysis of the feasible alternatives to the carrying out of the project, including an analysis of the alternatives/options considered, having regard to the project objectives. As such, any strategic alternatives were required to be considered in terms of the project objectives as outlined in Chapter 3 (Strategic context and project need) of the EIS.

Investment in rail freight was considered as a strategic alternative to the project as part of 'Alternative 2 – investment in alternative transport modes' in section 4.4.2 of the EIS. The Sydney freight network facilitates the movement of freight in Sydney and provides a link to the NSW rural and interstate rail network and intermodal network.

The *NSW Freight and Ports Strategy* (Transport for NSW 2013b) (*Freight Strategy*) states that about 63 per cent of NSW's freight in 2011 was transported by road and about 33 per cent by rail. When coal-related freight is removed, road-based freight movements account for nearly 90 per cent of the NSW freight task.

The volumes of all commodities demanding capacity on the freight network are expected to grow as population and economic activity increases across NSW. Port Botany and Sydney Airport are predicted to accommodate much of the rapid growth forecast for containerised cargo and air travel over the next 20 years (Infrastructure NSW 2014). The implications of this growth for the road and rail network are expected to be significant, with capacity across key parts of the network, particularly the Sydney metropolitan area, already under pressure to match demand.

Although opportunities exist to shift more freight from the road network onto the freight heavy rail network, the need to transport freight by road will continue. The *Freight Strategy* notes that dedicated freight rail corridors are being planned to ensure passenger and freight rail demand can be accommodated. However, rail freight transport is more effective for long distance transport of goods to regional centres while Sydney's freight, service and business task relies upon a dispersed point-to-point transport connection to customers within the metropolitan area.

NSW 2021: A Plan to Make NSW Number One (NSW Department of Premier and Cabinet 2011) outlines a target set by the NSW Government to double the 2011 share of container freight moved by rail through NSW Ports by 2020. Duplication of the Port Botany rail line was listed as a 'high priority initiative' in Infrastructure Australia's Infrastructure Priority List released in February 2016 and is being investigated by the NSW Government. Assuming the target share of moving container freight by rail is achieved, more than 70 per cent of Port Botany's trade would still be moved by road, requiring investment in an efficient road network to support the Port Botany and Sydney Airport precincts (NSW Department of Premier and Cabinet 2011). One of the actions arising from the *Freight Strategy* includes 'connect and complete Sydney's motorway network'. This includes the widening of the M4 and M5 motorways, connecting the M2 and M1 motorways and delivering the WestConnex program of works.

There is a need for the development of additional metropolitan intermodal terminals. Transport for NSW defines an intermodal terminal as 'an area of land used to transfer freight between at least two modes of transport'. To cater for the growth in the container market, new intermodal terminals have recently been established at Chullora (2015), Enfield (2016) and Moorebank (under construction). Strategic locations for potential future intermodal terminals and/or facilities include Eastern Creek and Western Sydney Airport to provide a connection to the Metropolitan Freight Network. However, even with new intermodal terminals, there remains a significant demand for road freight movements in the Sydney metropolitan area. Rail freight improvements alone are therefore not a viable alternative to meeting the project objectives.

The proposed Maldon to Dombarton Railway is currently being investigated by Transport for NSW. Infrastructure Australia's review of the project noted the project's cost currently outweighs the economic benefits and it is currently not commercially sustainable. While the railway could provide additional rail freight capacity in and out of Port Kembla and the Illawarra, this would not be sufficient to service the freight needs of Sydney which rely on a dispersed point-to-point transport connection to customers within the metropolitan area, and the existing infrastructure is sufficient to manage the short to medium-term rail capacity requirements for the Illawarra.

As part of the WestConnex program of works, the project supports the NSW Government's plans to deliver an integrated transport solution, comprising roads and public transport, to address congestion on Sydney's roads. Key corridors including the M4 and M5 motorways and Sydney CBD/Sydney Airport/Port Botany corridors, including parallel arterial roads, currently accommodate high levels of daily traffic including freight, commuter and leisure travel. Strategic alternatives limited to freight improvements alone are therefore not a viable alternative for catering to the diverse travel demands for commuter and leisure travel along these key corridors and relieving congestion on Sydney's roads.

The NSW 2016-2017 budget indicated that improving freight outcomes still remained a strong focus of the state with around $450 million planned to deliver critical road and rail freight projects across the state[1]. The NSW Government expressed its commitment to reducing the number of truck trips on busy urban roads by upgrading rail infrastructure to carry heavier and longer trains, reduce train delays and better separate rail freight from passenger services.

[1] https://www.transport.nsw.gov.au/newsroom-and-events/media-releases/budget-focuses-on-freight

C4.5 Assessment of strategic alternatives

1,503 submitters suggested other strategic alternatives to the M4-M5 Link project that were not assessed in the EIS. Refer to section 4.4 of the EIS for a description of the strategic alternatives assessed.

C4.5.1 Need for consideration of alternatives

Submitters suggested that other alternative solutions should be considered for the project as the EIS suggests that the project will result in more traffic congestion in some areas. Submitters raised the following suggestions with regard to other alternative solutions:

- Tolls should be implemented on Parramatta Road and the new roads should be free so that road users are more likely to use the new roads
- Alternatives that emit less pollution, or are more sustainable, including active transport, electric cars or reducing vehicle kilometres travelled (VKT)
- Impact of driverless cars on the whole transport system need to be considered
- Traffic should be taken away from the city, not through it
- Demand management including congestion pricing, changes to parking, time of day speed limit changes, road access pricing and encouraging employment hubs closer to residential areas, revenue could be returned to the community as discounts for car registration
- Prioritising the Sydney Gateway or other connections to Port Botany and Sydney Airport over the M4-M5 Link project
- Utilise the project funding for schools, healthcare or affordable housing
- Land use changes to reduce the need for longer trips
- Investment in infrastructure to help build new cities, regions and businesses in other parts of Sydney such as Parramatta City Centre
- Alternatives which are more effective, cheaper, less destructive, lower risk, safer, more innovative and visionary
- Only the development of Stage 1 of the project should be undertaken
- The EIS did not consider not going ahead with the project, based on the scale of impacts identified
- The City of Sydney Council's alternative plan should be considered.

Response

The SEARs for the project required that the EIS contain an analysis of the feasible alternatives to the carrying out of the project, including an analysis of the alternatives/options considered, having regard to the project objectives. As such, any strategic alternatives were required to be considered in terms of the project objectives as outlined in Chapter 3 (Strategic context and project need) of the EIS.

A range of alternatives to the M4-M5 Link were considered to identify the extent to which they could meet the project objectives (refer to section 4.4 of the EIS) and how well they performed with reference to other transport, environmental, social and economic factors.

The following strategic alternatives were considered:

- Alternative 1 – improvements to the existing arterial road network
- Alternative 2 – investment in alternative transport modes
- Alternative 3 – demand management
- Alternative 4 – the 'do nothing'/'do minimum' case
- Alternative 5 – development of the M4-M5 Link.

These alternatives are described in detail in section 4.4.1 to section 4.4.5 of the EIS.

The M4-M5 Link, as a component of the WestConnex program of works, supports a coordinated approach to the management of freight and passenger movements, and is complementary to all modes of transport including road, rail, bus, ferries, light rail, cycling and walking.

As explained in the EIS, while the NSW Government is investing $41.5 billion (2016–2017 NSW Budget) in transport projects over the next four years (including roads and public transport) there are no feasible strategic public transport or freight alternatives to the project that, on their own, would meet the diverse range of needs for travel in the Sydney metropolitan area.

The application of road tolls are a matter for the NSW Government. In October 2014, the NSW Government agreed to a broad set of principles for tolling for Sydney's motorways. Setting a toll on Parramatta Road would be inconsistent with many of these principles, including the principle that untolled alternative arterial road remain available for customers. Refer to **section C3.5.1** for further information regarding tolling for the project.

Strategic alternative – not going ahead with the project ('do nothing'/'do minimum' alternative)

The 'do nothing'/'do minimum' alternative considered in section 4.4.4 of the EIS assessed the alternative of not going ahead with the project. As a result of an expanding future population, employment and urban growth, Sydney can expect worsening road network and traffic conditions if integrated transport solutions are not implemented. The addition of the M4-M5 Link would provide a significant overall improvement to network productivity. A number of key benefits and improvements are forecast as a result of the project (when compared to not proceeding with the project):

- Non-motorway roads in the Inner West LGA are forecast to experience faster trips with the daily average speed increasing by about 10 per cent. Similarly, the vehicle distance travelled on non-motorway roads is forecast to reduce by about 12 per cent. This indicates that on average, these trips are fewer in number and faster
- Improved network productivity on the metropolitan network, with more trips forecast to be made or longer distances travelled on the network in a shorter time. The forecast increase in VKT and reduction in vehicle hours travelled (VHT) is mainly due to traffic using the new motorway, with reductions in daily VKT and VHT also forecast on non-motorway roads
- Reduced travel times are forecast on key corridors, such as between the M4 Motorway corridor and the Sydney Airport/Port Botany precinct
- Reduced traffic is forecast on sections of major arterial roads including City West Link, Parramatta Road, Victoria Road, King Street, King Georges Road and Sydenham Road
- Almost 2,000 heavy vehicles are forecast to be removed from Parramatta Road, east of the M4 East Parramatta Road ramps, each weekday.

The lost opportunities from not proceeding with the project mean that the 'do nothing'/'do minimum' case is not a feasible or realistic alternative. Notwithstanding this, the M4-M5 Link, as part of the WestConnex program of works, is one part of a broader solution to these pressures. For these reasons, the NSW Government is also investigating and investing in light rail, metro, bus rapid transit and motorways to provide a multi-modal response to the future challenges.

Strategic alternative – options that emit less pollution

Alternatives that emit less pollution were considered as part of the integrated transport solution including active transport and public transport improvements for Alternative 2 – investment in alternative transport modes in section 4.4.2 of the EIS. Active transport improvements are regarded as complementary to other transport modes including roads and public transport. The project includes the development of new or improved active transport links in a number of locations, generally associated with surface works and/or residual land for the project, such as at the Rozelle Rail Yards and along Victoria Road. These links would improve connectivity between communities, open space areas, public transport modes and the existing active transport network. Public transport options are discussed in **section C4.2**.

Future trends in transport, such as ride sharing and autonomous vehicles are addressed in section 3.2.5 of the EIS. The project would provide the road connections for the future range of vehicles, and in particular reduce through traffic on local surface roads by providing efficient alternative routes through the underground tunnel network.

While electric cars themselves are a cleaner technology, the determination of whether electric cars are 'cleaner' in terms of overall contribution to greenhouse gas emissions depends on a number of factors including the source of power at the charging stations – this could be from renewable energy or coal fired power stations. It is not within the scope of the project to determine if electric cars would emit less pollution than conventional vehicles using the project infrastructure.

An assessment of greenhouse gas emissions from the project was undertaken (refer to Chapter 22 (Greenhouse gas) of the EIS), which considered future scenarios with and without the project. It was estimated that there would be a reduction in vehicle emissions being generated by road users as a result of the project in the long-term, due to travel along a more direct route at higher average speeds, reduced congestion and reduced stop-start driving increasing vehicle fuel efficiency (refer to Chapter 22 of the EIS).

Strategic alternative – move traffic away from the Sydney CBD

The project, as part of a completed WestConnex program of works and the proposed future Western Harbour Tunnel project, would provide a western bypass of the Sydney CBD, alleviating pressure on existing north−south corridors including the Southern Cross Drive, A1 (the Princes Highway) and A3 (Centenary Drive/Roberts Road/King Georges Road) and the Sydney orbital network, as well as reducing traffic volumes on the Sydney Harbour Bridge and Sydney Harbour Tunnel. These changes would reduce journey times between Sydney's northern and southern suburbs. Predicted changes in traffic on Anzac Bridge as a result of the project would be managed through network performance reviews during operation (see environmental management measure OpTT1 in **Chapter E1** (Environmental management measures)) and the creation of a network integration strategy.

Public transport alternatives to access the Sydney CBD are also committed to or are under investigation by the NSW Government, including Sydney West Metro, Sydney Metro City and Southwest and CBD and South East Light Rail.

Strategic alternative – demand management

Demand management was considered as part of Alternative 3 – demand management in section 4.4.3 of the EIS. Travel demand management relates to minimising or avoiding the need to invest in new motorway infrastructure such as the project, by reducing individual trip lengths and making alternative transport mode options more viable.

To have a major impact on road traffic, travel demand management measures would require considerable changes in social attitudes, travel behaviour and government policy and can take many years to achieve. Therefore, while travel demand management could help reduce demand on the road network during peak times, its effectiveness would be limited by other constraints, such as:

- Land use patterns, in particular the location of new jobs relative to areas of residential growth
- The availability of alternative travel modes at the user's origin and destination such as public transport and active transport
- Flexibility of working arrangements to take advantage of 'time of day' tolling or transport pricing benefits.

Travel demand management changes alone are therefore not a viable alternative to meeting the project objectives. They are, however, viewed as complementary initiatives, together with the project, to reduce the impacts of road traffic on Sydney's road network.

Population growth, combined with the growing road freight task in the Sydney metropolitan area, would result in a continued demand for use of roads providing east-west and north-south connections such as the M4 Motorway, M5 Motorway, M1 Motorway and A3 and A6 corridors (refer to Figure 4-12 of the EIS). NSW Government policy has a focus on delivering transport projects, including public transport and Western Sydney Airport, and through this, employment growth in key centres such as Parramatta, Western Sydney Airport, and the southwest and northwest growth centres. Without infrastructure investment or significant changes to how people travel, the continued demand and use of these corridors would result in additional, prolonged congestion.

In November 2017, the NSW Premier announced a vehicle registration cashback scheme for motorists who spend more than $25 a week on tolls in NSW to claim free vehicle registration. The scheme (as announced) will be available for standard privately registered cars, utes, four-wheel-drives and motorcycles from 1 July 2018 and be backdated to July 2017. The scheme will not include trucks or other vehicles weighing more than 2,795 kilograms. This is expected to save the majority of motorists who apply to the scheme around $358 a year on registration costs, and some up to $715 a year.

Strategic alternative – prioritisation of the proposed future Sydney Gateway project

The project would be complementary to the proposed future Sydney Gateway which is in the early planning stages. A separate business case is planned to be developed for Sydney Gateway and it would be subject to environmental assessment and approval. Together with the other components of the WestConnex program of works and the proposed future Sydney Gateway, the M4-M5 Link project would facilitate improved connections between western Sydney, Sydney Airport and Port Botany and south and south-western Sydney, as well as better connectivity between the important economic centres along Sydney's Global Economic Corridor and local communities.

Strategic alternative – invest in infrastructure to help build new cities, regions and businesses

Investment in the M4-M5 Link, together with the other WestConnex projects, would assist in facilitating the delivery of other major city-shaping land use and transport improvements. As part of the broader WestConnex program of works, the project would support NSW's major sources of economic activity and provide a strategic response to the future transport demands on the already congested road network. The WestConnex program of works, which includes the project, has the potential to be a catalyst for major urban renewal, as identified in *A Plan for Growing Sydney* (NSW Government 2014) and the *Draft Central District Plan* (Greater Sydney Commission 2016).

The investment in Sydney's road network would facilitate improvements across the network and generate more than $20 billion worth of benefits to the Australian economy. Specifically, the project is expected to support around 1,550 construction jobs as well as numerous operational jobs.

The *Towards our Greater Sydney 2056* (Greater Sydney Commission 2016b) outlines a plan to develop a 'three cities' approach for the future of Sydney, with an 'Eastern City' (Sydney CBD), a 'Central City' (Parramatta CBD) and a 'Western City' (future Western Sydney Airport and surrounds). The project, as part of the WestConnex program of works, complements this vision by providing improved connectivity between the three cities.

Strategic alternative – invest in healthcare, schools or affordable housing

Investment in healthcare, schools and affordable housing is subject to the decisions of the NSW Government. The NSW Government has developed and delivered a NSW Budget for 2017-2018 which includes allocations for key infrastructure, including transport infrastructure (including investment for the M4-M5 Link), health infrastructure, new schools and upgrades to existing schools and a housing affordability package. Further information about the NSW Budget for 2017-2018 is available online[2].

The transport network in Sydney is expected to be put under increasing pressure over the next 20 years. *A Plan for Growing Sydney* (NSW Government 2014) indicated that from 2011 to 2031, Sydney's population is forecast to increase from 4.3 to 5.9 million, which equates to an average of 80,000 additional residents per year. Moreover, by 2036, the number of trips made around Sydney each day is forecast to increase by 31 per cent from 16 to 21 million vehicle movements. This growth would place increasing pressure on the NSW transport network and the key travel demand corridors connecting regional cities and major centres across the greater Sydney metropolitan area.

Key corridors currently accommodate high levels of daily traffic including freight, commuter and leisure travel. Users of these corridors frequently experience congestion and delay, particularly during weekday and weekend peak periods.

The *Draft Future Transport Strategy 2056* (Transport for NSW, 2017), the *NSW Long Term Transport Master Plan* (Transport for NSW 2012a) and the *State Infrastructure Strategy Update 2014* (Infrastructure NSW 2014) identify the need to plan and invest in the future of Sydney's motorway network, which provides vital infrastructure connections within and between travel demand corridors.

The project, as part of the WestConnex program of works, is one part of a broader solution to these emerging pressures. Investment in healthcare, schools and housing, while important, does not provide a solution to these pressures.

[2] https://www.budget.nsw.gov.au/

Strategic alternative – development of Stage 1 of the project only

The project would be constructed and opened to traffic in two stages. Stage 1 of the project involves the construction of the mainline tunnels between the M4 East at Haberfield and the New M5 at St Peters, stub tunnels to the Rozelle interchange (at the Inner West subsurface interchange) and ancillary infrastructure at the Darley Road motorway operations complex (MOC1) and Campbell Road motorway operations complex (MOC5). This would provide improved connectivity for western Sydney's population and growth centres with employment and business opportunities in the Sydney CBD and in the Sydney Airport and Port Botany precinct.

The Rozelle interchange and Iron Cove Link (Stage 2 of the project) are key components of the project. The Rozelle interchange would provide connectivity with the local surface road network at City West Link, The Crescent and Victoria Road and enable north-south connections between the New M5 at St Peters and Rozelle, and east-west connections between the M4 East at Haberfield and Anzac Bridge. The Rozelle interchange would also connect to Victoria Road via the Iron Cove Link. The Iron Cove Link would provide an underground connection between the Rozelle interchange and Victoria Road near the eastern abutment of Iron Cove Bridge, which would reduce traffic on Victoria Road and allow a more balanced surface road network in the Lilyfield/Rozelle area. The Rozelle interchange would also include ramps and supporting infrastructure to facilitate a future connection to the proposed future Western Harbour Tunnel and Beaches Link project.

Together, Stages 1 and 2 of the project would meet the project objectives to realise the holistic benefits and opportunities of WestConnex and enable future motorway network development that would support Sydney's long-term economic growth. The potential benefits of a staged opening of the project are detailed in Chapter 4 (Project development and alternatives) of the EIS.

C4.5.2 Analysis of strategic alternatives

Submitters were concerned by the analysis of strategic alternatives, as presented in the EIS, which were considered by some submitters to be superficial. Submitters were also concerned that not enough analysis was undertaken on the following alternatives:

- The assessment of different packages of integrated transport measures was inadequate
- Smaller scale projects can provide similar benefits as the project and these were not considered
- Integration of the District Plans and the *Draft Future Transport Strategy 2056* into the planning of the project or alternatives
- The alternative plan prepared by the City of Sydney has not been seriously considered
- There is no evidence of scenario modelling being used to test the ability of different packages of integrated transport measures
- Strategic Alternative 2 – investment in alternative transport modes was not satisfactorily assessed and the EIS is biased towards a motorway solution so that other proposed alternatives will fall short
- There was no assessment of the benefits that would be achieved if a clean air alternative was used such as demand reduced public transport, banning diesel vehicles and freight on rail
- The analysis of alternatives did not consider strategic solutions used by other cities around the world
- The assessment of Strategic Alternative 3 – travel demand management was inadequate and should identify key network capacity issues and draw on a process of multi-modal transport modelling to inform the analysis and assessment
- No modelling or analysis has been provided of whether appropriate upgrades to existing road connections might provide far more cost effective and time efficient connections
- Analysis of alternatives, including upgrading the A3, have not been considered in appropriate detail.

Response

The scope of the EIS was designed to address the SEARs, which focused on the assessment of impacts (adverse and beneficial) from the construction and operation of the M4-M5 Link project. The EIS was prepared in accordance with Part 5.1 of the EP&A Act, the SEARs and Part 3 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (NSW). A checklist against this regulation is provided in Appendix D of the EIS. A copy of the SEARs, including an indication of where they are addressed in the EIS is provided in Appendix B (Secretary's Environmental Assessment Requirements checklist) of the EIS.

The need for investment in transport infrastructure in NSW, including the WestConnex program of works, has been established by the NSW Government at a strategic level in state planning and policy documents (see **section C3.1.1**). These consider the approach of other world cities to infrastructure investment while also considering the unique context and infrastructure needs of Sydney. The *WestConnex Updated Strategic Business Case* (SMC 2015a) was prepared to assess the viability of the WestConnex program of works as part of a broader integrated transport and land use solution for NSW. Subsequent EISs for each stage of the WestConnex program of works, including the EIS for the M4-M5 Link, have therefore carried out an assessment of strategic alternatives in consideration of the established strategic transport and land use policy context and the recognised need for the WestConnex program of works as set out in the *WestConnex Updated Strategic Business Case*. Section 4.4 of the EIS and **section C4.5.1** discusses the strategic alternatives to the project that were considered.

Section 4.4.2 of the EIS considered investment in alternative transport modes, including public transport, rail freight, road freight, Western Sydney Airport and active transport improvements. This section considered each of these as an alternative to the M4-M5 Link project. The review concluded that while the NSW Government is investing $41.5 billion (2016–2017 NSW Budget) in transport projects over the next four years (including roads and public transport) there are no feasible strategic public transport or freight alternatives to the project that, on their own, would meet the diverse range of needs for travel in the Sydney metropolitan area. The M4-M5 Link is only one of many transport projects that are being delivered by the NSW Government to respond to Sydney's transport challenges.

A number of smaller scale transport programs are being undertaken to improve integrated transport infrastructure. Roads and Maritime are committed to delivering the Easing Sydney's Congestion program of works, which would include some new infrastructure and intersection improvements to improve capacity and cater for traffic growth. Transport for NSW is also undertaking projects to improve safety and accessibility to public transport stations and ferry wharves (the Transport Access Program).

As outlined in **section C4.5.1** and section 4.4.3 of the EIS, travel demand management changes alone are not a viable alternative to meeting the project objectives. They are, however, viewed as complementary initiatives, together with the project, to manage forecast growth in demand on Sydney's road network. The assessment and implementation of travel demand management measures would need to be carried out by the NSW Government at a network-wide level and would be subject to detailed strategic assessment to determine the range and effectiveness of measures that could be implemented, as well as to ascertain the potential impacts (adverse and beneficial).

Detailed traffic modelling has been carried out for the project to determine the forecast changes in demand on the road network as a result of the project (refer to Chapter 8 and Appendix H (Technical working paper: Traffic and transport) of the EIS.

An assessment of smaller scale projects including upgrades to the existing arterial road network such as the A3 as an alternative to the project was considered in section 4.4.1 of the EIS. It was determined that smaller scale improvements to the arterial road network (such as improving intersection performance and implementing traffic calming measures, lane closures or clearways) would only provide incremental change in the efficiency of the road network, and would not support the additional capacity required for regional traffic growth, which is associated with the forecast increase in Sydney's population (from 4.3 to 5.9 million between 2011 and 2031 (NSW Government 2014a) and subsequent increases in VKT.

The *Draft Central District Plan* was considered during the development of the project. The Plan identifies the project and other components of WestConnex as 'regionally significant transport infrastructure'. The Plan also acknowledges the opportunities provided by WestConnex to improve pedestrian and cyclist connections, enable urban renewal, improve transport services, and enhance amenity, especially along sections of Parramatta Road. See section 3.1.9 of the EIS for further detail regarding consideration of the *Draft Central District Plan*.

The *Draft NSW Future Transport Strategy 2056* (Transport for NSW 2017), released following the exhibition of the EIS, supports an integrated approach to transport infrastructure for long-term planning. The strategy builds on the *NSW Long Term Transport Master Plan* (Transport for NSW 2012a) (*Transport Master Plan)*, of which the WestConnex program of works forms part of the strategic response to future transport demands.

City of Sydney alternative strategy to WestConnex

The City of Sydney Council's alternative strategy to WestConnex has been considered in responses throughout this Submissions and preferred infrastructure report. The main components of the alternative strategy are listed below along with the relevant section of this report that respond to the specific issues raised:

- The need for the project is not justified because traffic modelling overestimates that amount of people that would travel into the Sydney CBD from western Sydney – the project need and the consistency of the project with community needs is discussed in **section C3.2.1** and **section C3.3.2** respectively. Concerns regarding the traffic modelling for the project are discussed in **section C8.11.1**
- The A3 corridor should be upgraded instead of the project – the alternative to upgrade the existing A3 corridor is described in **section C4.1.1**
- Road users will not be able to afford tolls – concerns regarding the need, cost and duration of tolling is described in **section C3.5.1** and the cost of tolling on businesses and individuals is discussed in **section C14.8.2**.
- New technology will increase the capacity of existing motorways – consideration of future transport trends including new technology such as connected and autonomous vehicles (CAVs), ride-share and car-share initiatives are discussed in **section C3.2.7**.

A response to the City of Sydney Council's submission on the EIS is provided in **section B10**.

The M4-M5 Link, as a component of the WestConnex program of works, supports a coordinated approach to the management of freight and passenger movements, and is complementary to other transport modes including road, rail, bus, ferries, light rail, cycling and walking. However, Sydney's freight, commercial and services tasks require distribution of goods and services across the Sydney basin, which relies on diverse and dispersed point-to-point transport connections that are most efficiently provided by the road network.

C4.6 Options development

412 submitters raised concerns over the option development for the M4-M5 Link project. Refer to sections 4.4, 4.5 and 4.6 of the EIS for details on the strategic alternatives, project evolution and design refinements and other project options considered.

C4.6.1 Assessment of options development process

Submitters raised concerns regarding the options development process for the M4-M5 Link project as described in the EIS. Specific areas of concern include:

- The EIS states that Blackmore Park and Easton Park were not selected for tunnelling as a result of feedback from the community however this was a false claim as the sites were unsuitable for other physical factors
- Concern that tunnel components for future connections to the motorway network will be added at a later stage of the project due to the removal of the Camperdown interchange from the scope
- Alternative routes to the M4-M5 link have not been addressed in the EIS.

Response

Alternative locations for construction ancillary facilities were considered during the development of the concept design for the project and are described in section 4.6.2 of the EIS. The rationale for excluding sites from the project is provided in Table 4-7 of the EIS. Blackmore Park and Easton Park were identified through community feedback as being important open spaces for the community. This, together with other technical and environmental factors, as described below, was considered during the site selection.

Section 4.6.2 of the EIS identified that the use of Blackmore Park, Leichhardt as a construction ancillary facility would require temporary loss of passive and active open space and vegetation removal. Further, access to the site was constrained by a narrow road (Canal Road) and the restricted height clearance under the light rail bridge.

The use of Easton Park, Rozelle as a construction ancillary facility would require temporary loss of passive and active open space, vegetation removal and impacts on heritage items (Easton Park and Sydney Water sewage pumping station). Use of this site would have also required closure of part of Lilyfield Road. Design optimisation led to the relocation of cut-and-cover tunnel structures to within the Rozelle Rail Yards; therefore this site could be avoided.

The need for a connection at Camperdown was first identified in the WestConnex reference scheme in the *State Infrastructure Strategy*. The Camperdown interchange was intended to provide entry and exit ramps connecting to Parramatta Road for drivers travelling to and from the Sydney CBD. Following an assessment of traffic, environmental and community impacts, the Camperdown interchange was removed from the project. The benefits of removing the Camperdown interchange from the project are outlined in section 4.5.1 of the EIS.

The traffic implications of removing the Camperdown interchange on the M4-M5 Link project and the wider road network have been assessed in Chapter 8 (Traffic and transport) and Appendix H (Technical working paper: Traffic and transport) of the EIS.

Alternative routes for the project were developed since the inception of the WestConnex program of works. These alternative routes were influenced by geotechnical considerations, providing optimal connectivity, proximity to construction sites and potential vibration and settlement impacts on sensitive equipment at the Royal Prince Alfred Hospital and University of Sydney. A discussion on the considerations of the mainline tunnel corridor alignment development and review are provided in section 4.5 of the EIS.

Future development or refinement of the project would be assessed in accordance with the EP&A Act where required.

C4.7 Development of the M4-M5 Link concept design

Three submitters raised concerns about changes since the concept design. Refer to section 4.5 of the EIS for details on design evolution and refinements assessed in the EIS.

C4.7.1 Changes from the concept design

Submitters raised concerns over departures from the concept design that was originally proposed. Specific areas of concern include that the tunnel alignment in the EIS is shown under residential properties at locations markedly different from the concept design. In particular the concept design showed the tunnel alignment beneath Algie Park but in the EIS it is now shown beneath heritage homes at Haberfield - this should be changed back.

Response

The concept design was refined with regards to ongoing geotechnical investigations and tunnel geometry to allow merging of the mainline tunnels with the Wattle Street interchange entry ramps. To efficiently manage the merge between the Wattle Street interchange entry ramp and the mainline tunnels and the approach to the Inner West subsurface interchange, the Wattle Street interchange entry ramp would divide into two, one-lane entry ramps about midway along the entry ramp (around Alt Street at Haberfield). These single lane tunnels would then join with the southbound mainline tunnel before the Inner West subsurface interchange. The southernmost entry ramp would be located underground near the southern section of Algie Park.

In the vicinity of Algie Park the mainline tunnels are at a depth of around 32 metres below ground level and located in good quality Hawkesbury Sandstone (refer to Appendix E (Geological long sections) of EIS). As a result, the risk of impacts at the surface above the tunnels are limited. Further information regarding tunnel depth is provided in **section C5.3**. An assessment of potential impacts to properties, including heritage buildings, from vibration and settlement are provided in Chapter 10 (Noise and vibration), Chapter 12 (Land use and property) and Chapter 20 (Non-Aboriginal heritage) of the EIS. Measures to manage these impacts are outlined in **Chapter E1** (Environmental management measures).

C4.8 Mainline tunnel options

55 submitters raised concerns about mainline tunnel locations. Refer to section 4.5 of the EIS for details on options considered for the mainline tunnels.

C4.8.1 Mainline tunnel location options

Submitters raised concerns regarding the proposed location of the tunnel alignments. Submitters included the following options for the locations of the tunnels:

- The tunnel should be relocated to avoid impacts to electrical utilities located beneath Kings Row at Newtown and a sewerage pipeline below Angel Street at Newtown
- Objection to tunnels constructed under heritage buildings
- Relocate main tunnel further southwest
- Consider tunnel from Rozelle to Parramatta Road as an option
- Consider tunnel route from existing harbour bridge tunnel connecting to Port Botany
- Proposal for St Peters connections to be closer to the airport or connect directly to the airport
- Consider a route further west from Sydney Olympic Park to Chullora
- Consider connecting to the Cross City Tunnel instead
- Direct the route to access and stimulate the new airport and Parramatta
- The tunnel should avoid Haberfield
- The project should not connect to Waratah Street at Haberfield.

One submitter supported the majority of connecting roads proposed to be constructed underground, which is an improvement over previous concepts.

Response

The mainline tunnel of the M4-M5 Link would provide the missing connection between the M4 East at Haberfield and New M5 at St Peters, which are under construction and will be open to traffic in 2019-2020. The tunnel alignment was also influenced by the project objective to improve access to economic centres, including Sydney Airport and Port Botany.

The general alignment of the WestConnex corridor has been consistently detailed in a number of State policy documents since 2012 (refer to section 4.2 of EIS). Several changes to the M4-M5 tunnel alignment have occurred since 2012 and during development of the concept design in order to meet the project objectives, and as a result of further investigations and community and stakeholder feedback. These changes include a northern extension to Rozelle to link with Anzac Bridge and to provide a long term motorway connection to the proposed future Western Harbour Tunnel project, removal of Camperdown interchange and inclusion of the Iron Cove Link.

The horizontal and vertical alignment of the tunnel corridor between the fixed points (ie the interchanges) was influenced by the following considerations:

- Investigations into geology, geotechnical (ie ground conditions) and groundwater conditions, especially at tunnel portals and crossings under creeks
- Potential for contamination
- Facilitating drainage

- Avoiding long, steep road gradients that would slow heavy vehicles and increase vehicle emissions
- Location of sensitive receivers above the tunnels (including heritage items, educational institutions, places of worship, hospital and medical facilities) that may be potentially affected during construction of the tunnels
- Location of major underground utilities and services (such as water and sewer mains and fibre optic telecommunications cables) that could potentially be impacted
- Location of existing or proposed subsurface infrastructure (such as for the Sydney Metro City and Southwest tunnels and the Sydney Water City and Pressure tunnels)
- Future connections to the Sydney motorway network
- Fire and life safety considerations (including emergency egress points from the tunnels).

Geotechnical conditions are a major consideration for tunnelling projects as they determine ground stability to support tunnel infrastructure and the potential for ground movement or settlement at the surface. Geotechnical conditions also affect constructability, including, how difficult, how long and how costly it would be to construct the tunnels.

A number of horizontal and vertical alignment options for the mainline tunnels were considered to achieve optimal connectivity between the M4 East and New M5 projects as well as with the Rozelle interchange. Issues considered as part of the alignment review included:

- The suitability of geological conditions
- The provision of the shortest travel distance/travel time
- The location of state heritage listed items at Camperdown
- The orientation of the Wattle Street ramps being constructed for the M4 East project
- The proximity of the mainline tunnels to potential construction sites for tunnelling
- Potential vibration and settlement impacts on sensitive equipment at the Royal Prince Alfred Hospital and University of Sydney
- The location of the Sydney Metro City and Southwest tunnels
- The locations of the Sydney Water Pressure Tunnel and Sydney Water City Tunnel
- The design of the Rozelle interchange.

Further information regarding the depths of the tunnels is provided in **section C5.3**. An assessment of potential impacts to properties, including heritage buildings, from settlement, is provided in Chapter 12 (Land use and property) and Chapter 20 (Non-Aboriginal heritage) of the EIS. During detailed design, an assessment would be carried out to clarify potential settlement or vibration impacts on buildings and utilities located above the project tunnels and identify appropriate management measures.

Other mainline tunnel options suggested by submitters include a direct connection to the Cross City Tunnel. Alternative tunnel alignments between different areas in Sydney would not provide a bypass of the Sydney CBD or provide the required link between the M4 East and New M5 motorways to realise the benefits and opportunities of the WestConnex program of works.

A road link between the St Peters interchange (which is approved and under construction as part of the New M5 project) and Sydney Airport, with connections towards Port Botany is the subject of the proposed future Sydney Gateway project. Sydney Gateway is currently in design development phase and subject to final business case and environmental assessment.

An alternate route from Sydney Olympic Park to Chullora or towards the proposed Western Sydney Airport and Parramatta would not meet the project objectives to connect the M4 East and New M5. The NSW Government and Australian Government are implementing a *Western Sydney Infrastructure Plan* (NSW Government 2016a) which includes a number of road projects, for example the M12 Motorway, which are outside the scope of this project.

Works at the Wattle Street interchange (which is approved and under construction as part of the M4 East project) for the project would be limited to the construction entry and exit ramp connections to the mainline tunnels and minor physical integration works with the surface road network. The design of the Wattle Street interchange including connections to Waratah Street is subject to the M4 East project and is therefore beyond the scope of the M4-M5 Link.

Support for the underground road connections is noted.

C4.8.2 Mainline tunnel design options

Submitters raised concerns regarding the proposed number of lanes and tunnel alignments. Submitters suggest that the tunnels should consist of three traffic lanes instead of two.

Response

Three options (two, three or four lanes in each direction, plus merges and tie-ins) were originally considered for the number of traffic lanes within each of the mainline tunnels, as discussed in section 4.5.2 of the EIS.

While the initial project concept described up to three lanes in each direction, revised traffic modelling, which incorporated updated land use inputs and changes to the project design, indicated that amendments to the original three lane configuration were required to maintain acceptable lane functionality and traffic flow within the mainline tunnels in future years. Traffic modelling demonstrated that the mainline tunnels would operate more efficiently under a four-lane configuration, to allow for future demand increases. However, while the majority of the mainline tunnels are designed for four lanes (plus merges and tie-ins), they reduce to three lanes at the M4 East mainline tunnel interface and to two lanes at the New M5 mainline tunnel interface. Where the mainline tunnels connect to the Inner West subsurface interchange, they would be two lanes for a distance of approximately one kilometre. Lane configurations in the mainline tunnels are shown in Table 5-4 of the EIS. An assessment of operational performance of the M4-M5 Link motorway based on forecast traffic in various sections of the tunnels is provided in section 8.3.3 of the EIS.

C4.9 Rozelle interchange options

39 submitters raised concerns about options considered for the Rozelle interchange. Refer to section 4.5 of the EIS for details on the options considered.

C4.9.1 Alternatives to the Rozelle interchange

Submitters objected to the use of the Rozelle Rail Yards for the Rozelle interchange. Submitters raised the following suggestions of alternatives to the Rozelle interchange:

- Propose that the Rozelle interchange area (the Rozelle Rail Yards) be used for housing and employment uses as proposed in *The Bays Precinct Transformation Plan*
- Objection to the entire Rozelle interchange as there is an existing link from the North Shore to Sydney Airport via freeways and due to its indicative nature
- Implement a simple tunnel connection to Anzac Bridge instead of directing traffic to Victoria Rd and the Northern suburbs
- Remove the Rozelle interchange and reinvest in upgrading the existing City West Link to Wattle Street interchange
- Provide a direct connection between the New M5 to the M4 East and Ashfield only
- Consider a straight line tunnel design for the proposed mainline tunnel between Wattle Street and Anzac Bridge
- Revert to the initial design and intention of the M4-M5 Link by removing the Rozelle interchange and providing direct connection to Port Botany
- Remove the Rozelle interchange and reinvest funds in developing the Rozelle Rail Yards as green space for a future White Bay development

- Remove the Western Harbour Tunnel stubs from the design until that project is approved in its entirety. The works are a major addition to the project and are not considered in the WestConnex business case.

Response

The Rozelle interchange is a key component of the project as it would provide connectivity with the local surface road network at City West Link, The Crescent and Victoria Road. In addition, it provides a north-south corridor between the New M5 at St Peters and Rozelle that would bypass the Sydney CBD. The Rozelle interchange would also facilitate future growth in Sydney's transport network by allowing for connections to the proposed future Western Harbour Tunnel and Beaches Link. This future connection would provide a western bypass of the Sydney CBD, alleviating pressure on existing north−south corridors including the Southern Cross Drive, A1 (the Princes Highway) and A3 (Centenary Drive/Roberts Road/King Georges Road) and the Sydney orbital network, as well as reducing traffic volumes on the Sydney Harbour Bridge and Sydney Harbour Tunnel. These changes would reduce journey times between Sydney's northern and southern suburbs.

As part of the Rozelle interchange, the M4-M5 Link would construct mainline tunnel and ramp connections to the proposed future Western Harbour tunnel as well as associated infrastructure. Construction of these connections would allow for orderly planning of these respective projects, and would minimise cumulative construction impacts on the community around the Rozelle interchange. This approach would also avoid or minimise potential delays to the delivery of the urban design and landscaping outcome at the Rozelle Rail Yards proposed as part of the project, which may otherwise be delayed and/or staged due to extended use of a portion of this land for construction activities associated with the proposed future Western Harbour Tunnel project.

While the construction impact of the proposed future Western Harbour Tunnel entry and exit ramps connecting to City West Link is included in this EIS, the operational traffic impact of these ramps has not been included in the traffic assessment for the M4-M5 Link. A preliminary assessment with these ramps operational has been carried out and indicates that there is likely to be some reduction in traffic on the Western Distributor and Sydney Harbour Bridge, as more traffic would be able to access the proposed future Western Harbour Tunnel. However, there is likely to be increased traffic on City West Link, The Crescent and Johnston Street. Environmental impact assessment and approval for the operation of these elements of the Western Harbour Tunnel project would be subject to the EIS prepared for the Western Harbour Tunnel project.

The Bays Precinct Transformation Plan identifies the former rail yards (the Rozelle Rail Yards) as providing an opportunity for mixed housing as well as public spaces and employment uses. *The Bays Precinct Transformation Plan* also identifies the potential for opportunities provided by the redevelopment of the Rozelle Rail Yards for integration and connection of communities to the north and south through the creation of public open space and improved connections between Lilyfield and the waterfront.

As described in section 3.1.12 of the EIS, while the project is consistent with *The Bays Precinct Transformation Plan* vision for the creation of new open spaces, provision of new pedestrian and cyclist links, connecting communities and the acknowledgment of the rail heritage of the area, it is inconsistent with the Plan with respect to the development of the Rozelle Rail Yards for mixed housing and potentially also for employment uses.

The reasons for the project being inconsistent with elements of this vision can be attributed to the nature of the project and the geographical area required for its construction and operation and also the commitment made by the NSW Government (announced in July 2016) that the project would deliver up to 10 hectares of new open space and active transport links for the community at the Rozelle Rail Yards.

Road network connectivity to The Bays Precinct would be improved from the west and south as a result of the project. While there are existing north-south links between areas such as the Northern Beaches and Sydney Airport, the M4-M5 Link project, as part of a completed WestConnex program of works and the proposed future Western Harbour Tunnel and Beaches Link program of works, would provide a western bypass of the Sydney CBD, alleviating pressure on existing north−south corridors including Southern Cross Drive, the A1 (the Princes Highway) and A3 (Centenary Drive/Roberts Road/King Georges Road) corridors and the Sydney orbital network, as well as reducing traffic volumes on the Sydney Harbour Bridge and Sydney Harbour Tunnel. Screenline analysis undertaken for the traffic assessment in the EIS demonstrates that these existing links would be heavily congested in 2023 and 2033 without the project (refer to section 8.3.3 and Appendix H (Technical working paper: Traffic and transport) of the EIS).

The Rozelle interchange tunnels would connect the mainline tunnels (via the Inner West subsurface interchange) with:

- The existing surface road network at City West Link, The Crescent and Victoria Road
- The Iron Cove Link, which would connect to the existing surface road network at Victoria Road near the eastern abutment of Iron Cove Bridge (see below)
- The proposed future Western Harbour Tunnel and Beaches Link program of works.

A simple tunnel connection to Anzac Bridge would not provide this same level of connectivity proposed for the Rozelle interchange, and would push traffic heading to other locations onto the surface road network. The Rozelle interchange would enable long-term Sydney motorway network development.

Upgrades to surface roads such as extending the existing City West Link to Wattle Street interchange would be constrained by a number of existing at-grade intersections and the requirement for significant property acquisitions along the corridor to accommodate road widening in a constrained urban environment. Open space areas adjacent to City West Link and Hawthorne Canal such as Robson Park, and the Inner West light rail corridor would also potentially be affected. Upgrades to the road network at City West Link would not provide a motorway alternative to remove traffic from surface roads.

Upgrades to surface roads or direct tunnels providing only north-south (M4 East to New M5) or east-west (M4 East to Anzac Bridge) would also not provide a bypass of the Sydney CBD or provide the required link between the M4 East and New M5 motorways to realise the benefits and opportunities of the WestConnex program of works.

C4.9.2 Rozelle interchange options

Submitters suggested various options regarding tunnels, portals and ventilation facilities at the Rozelle interchange area as follows:

- More of the Rozelle infrastructure should be moved underground, including ventilation facilities and the above ground portals
- Relocate the Rozelle interchange away from Annesley Street at Leichhardt to travel under industrial areas, Easton Park or the city instead of residential areas which may result in adverse impacts to houses
- Other options for phase 2 works (the Rozelle interchange) should be considered including its redesign
- Objection to the location of portals near homes in north Annandale and in close proximity to the proposed recreational area in the Rozelle Rail Yards
- The Western Harbour Tunnel portal at the Rozelle interchange should be removed and replaced with an underground connection elsewhere due to potential congestion.

Response

The need for the Rozelle interchange is established in the response in **section C4.9.1**.

The Rozelle Rail Yards are part of a disused former rail corridor owned by the NSW Government. Use of this site was considered beneficial to minimise environmental impacts and acquisition requirements while meeting constructability, connectivity and urban design objectives for the project. However, initial designs of the interchange were predominantly aboveground and included significant elevated structures to achieve connectivity.

The design of the interchange considered:

- Using NSW Government owned land and minimising property acquisition
- Maximising positive urban design solutions for residual land including new open space areas and new and improved active transport links
- Minimising impact on public open space and recreational land
- A connection to the proposed future Western Harbour Tunnel and Beaches Link program of works
- Maximising connectivity to the surrounding road network and The Bays Precinct

- Minimising impacts on surface water and groundwater
- Minimising impacts on utilities.

Three main concept designs have been considered for the Rozelle interchange:

- Predominantly above ground within the Rozelle Rail Yards
- Predominantly below ground within the Rozelle Rail Yards
- Predominantly below ground and extending north of the Rozelle Rail Yards.

Each of these options for the Rozelle interchange is described in section 4.5.1 of the EIS. In summary:

- The option predominantly below ground and north of the Rozelle Rail Yards is characterised by the following:
  - Predominantly below-ground allows for improved residual land outcomes
  - Better open space/recreational land outcome
  - Tunnelling in better geotechnical conditions
  - A more natural drainage solution that respects existing flow paths
  - Constructability activities contained within the Rozelle Rail Yards with no impact on Easton Park
  - More easily implemented active transport links
  - More extensive tunnelling under residential areas, although at depth.

While the majority of road infrastructure at the Rozelle Rail Yards would be located underground, some structures would be required to be located above ground. Above ground portals are required at the Rozelle interchange to connect the project tunnels to the surface road network. The tunnel portals would be largely covered by earthworks and embankments to form part of the overall landform of the open space, and would be landscaped to soften their visual impact and integrate with other infrastructure, such as the ventilation facility and active transport bridges. The portals themselves would be simple structures and largely unadorned to ensure the landscape forms the most dominant feature. The portals would be located within the road corridor and would not be located adjacent to residential properties. Potential environmental impacts associated with the portals on nearby residential areas and the proposed open space at the Rozelle Rail Yards are assessed throughout the EIS.

The three ventilation outlets at the Rozelle ventilation facility are required to be 35 metres in height above the existing ground level to ensure effective and efficient dispersion of emissions and to meet the required air quality standards. The concept design of the three ventilation outlets would be refined in accordance with the urban design principles developed for the project (refer to section 13.2.2 of the EIS) during the development of UDLPs, which will be prepared based on the detailed design. Refer to **section C13.4.1** for further information.

The air intake facility, water treatment facility and electricity substation are required to be located above ground due to access and maintenance requirements. These structures would be designed in a manner that allows them to become recessive elements within the overall park design at the Rozelle Rail Yards. Elements such as the water treatment facility and ventilation facilities would be co-located to offer more functional open space areas to the community.

The alignment and depth of tunnels have been designed having regard to the geological conditions along the alignment, the road geometry, cross-sectional dimensions of the project tunnels and to minimise surface impacts where possible. For the majority of the alignment, the tunnels are at depths of greater than 35 metres below ground and in competent bedrock. As a result, the risk of ground movement is limited. In some discrete areas where there is shallower tunnelling or where multiple tunnels are located closer to each other, more ground movement is predicted. A range of design and construction options are available to minimise ground movement in these circumstances as discussed in section 12.3.4 of the EIS. Further information regarding tunnel depth is provided in **section C5.3**.

Tunnel portals at the Rozelle interchange have been designed to provide essential connections to the surface road network at Rozelle and Lilyfield and enable future connections to the proposed future Western Harbour Tunnel project at Rozelle. A preliminary assessment of the impact of traffic from the proposed future Western Harbour Tunnel was considered in section 8.3.4 of the EIS.

C4.10 Rozelle surface works options

Seven submitters raised concerns about surface work options at Rozelle. Refer to section 6.5 of the EIS for details on proposed surface works at the Rozelle interchange and surrounds.

C4.10.1 Rozelle surface works options

Submitters objected to particular surface works elements associated with the Rozelle interchange. Submitters raised the following suggestions of options for surface works at the Rozelle interchange:

- Entrances and exits for the M4-M5 Link and the future proposed Northern Beaches Link [Western Harbour Tunnel and Beaches Link] should be integrated to reduce interruption to traffic flow
- Remove traffic lights from the design of the project
- Construct an overpass for traffic turning right from Victoria Road onto City West link to remove traffic lights
- Realign the proposed alignment at The Crescent to the east
- Opposition to the use of the Rozelle Rail Yards for the project
- All new surface roads around the Rozelle interchange should be covered to minimise noise impacts to nearby residents.

Response

Tunnel portals at the Rozelle interchange have been designed to provide essential connections to the surface road network at Rozelle and Lilyfield and enable future connections to the proposed future Western Harbour Tunnel project at Rozelle. A preliminary assessment of the impact of traffic from the proposed future Western Harbour Tunnel was considered in section 8.3.4 of the EIS. Combining the tunnel portals into one at-grade intersection is not feasible given the large number of traffic lanes that would be required when considering the combined traffic volumes of the M4-M5 Link and Western Harbour Tunnel to City West Link at Rozelle.

Free flow connections to Victoria Road and Anzac Bridge are proposed as part of the project. The construction or modification of intersections with traffic lights (traffic signals) for the project is required where free flow connections are not optimal due to design or connectivity constraints. The project would involve the following intersection works:

- A connection between the New M5 and the surface road network at Lilyfield and Rozelle, via a new intersection with City West Link between Catherine Street and The Crescent
- A connection between the surface road network and the proposed future Western Harbour Tunnel and Beaches Link, via the realigned intersection of City West Link and The Crescent.

The intersections would be designed to safely and efficiently manage traffic entering and leaving the surface road network and the Rozelle interchange at these locations. An overpass connecting Victoria Road with The Crescent/City West Link is not considered a viable alternative to traffic signals given the constrained nature of the road corridor in this location.

The Crescent at Annandale between City West Link and Johnston Street would be realigned westwards by up to around 75 metres. The area to the east of the realigned intersection is required for the land bridge between the Rozelle Rail Yards and The Crescent and associated active transport infrastructure. The proposed alignment of The Crescent would allow for:

- The proposed future Western Harbour Tunnel portals and layout of open space area on the opposite side of City West Link
- Staged delivery of roadworks at The Crescent and reconstruction of the bridge over Whites Creek
- Additional active transport links (bridges) at the intersection of City West Link and The Crescent.

The project is not proposing new surface roads around the Rozelle interchange. However, entry and exit ramps to connect the Rozelle interchange tunnels with the surface road network are proposed. The design of the Rozelle interchange has sought to maximise the length of the entry and exit ramps that can be covered (ie in tunnel or cut-and-cover configuration). However, covering these in their entirety is not possible as these ramps need to connect with the existing road network.

Operational noise impacts associated with the Rozelle interchange are further described in section 6.2 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Iron Cove Link options are discussed in **section C4.11**.

C4.11 Iron Cove Link options

24 submitters raised concerns about options for the Iron Cove Link. Refer to section 4.5 of the EIS for details on the options considered.

C4.11.1 Alternatives to Iron Cove Link tunnel options

Submitters questioned the need for the Iron Cove Link. Alternative suggestions include that the project should tunnel from Rozelle under Iron Cove Bridge with the entrance to the tunnel located at the base of the Gladesville Bridge or other locations in Drummoyne rather than at Rozelle. A submitter also suggested tunnelling to Huntleys Point.

Response

The Iron Cove Link would provide motorists with an underground alternative to Victoria Road. A traffic analysis shows the Iron Cove Link is forecast to reduce traffic demand along Victoria Road between Iron Cove Bridge and the intersection with The Crescent. The traffic analysis carried out for this section of Victoria Road is provided in Chapter 8 (Traffic and transport) and in Appendix H (Technical working paper: Traffic and transport).

By reducing traffic demand along sections of Victoria Road, the Iron Cove Link could enable potential future revitalisation opportunities along Victoria Road, including the provision of better active transport and public transport facilities. These suggested active transport and public transport facilities do not form part of the project and would be subject to separate environmental assessment as appropriate.

Community consultation undertaken during preparation of the concept design and EIS for the project raised the possibility of extending the Iron Cove Link further to the north, to the southern side of the Gladesville Bridge at Drummoyne (refer to section 4.5.3 of the EIS). This possible extension was not considered further as part of the M4-M5 Link project for the following reasons as it:

- Could not be delivered within the project budget
- Is it not currently identified as a policy priority of the NSW Government
- Would likely to require additional property acquisition
- Would require further investigation, including a cost and benefit analysis.

Many of the reasons which led to an extension to the Gladesville Bridge not being further considered as part of the project would also be applicable for a tunnel which extended to Huntleys Point. Although the option of a tunnel to Huntleys Point is outside the scope of the M4-M5 Link project, the development of the Iron Cove Link does not preclude a further tunnel connection to the north at some stage in the future.

C4.11.2 Iron Cove Link options

Submitters raised concerns regarding specific parts of the Iron Cove Link concept design with options suggested as follows:

- The design could be improved by creating access to the Iron Cove Link from Terry Street for residents of the Balmain peninsula
- Convert Manning Street to a two-way street to increase ease of access to King George Park
- Tunnel should extend further along Victoria Road.

Response

As described in section 4.5.3 of the EIS, options for the alignment of the Iron Cove Link were determined by the two terminal points, namely the Rozelle interchange and Victoria Road. Potential portal locations along Victoria Road included:

- Between Crystal Lane and Wellington Street, near the site of the current United Petroleum service station
- In the vicinity of Terry Street.

Of the two options, tunnel portals at Crystal Lane were considered to be less desirable as this option would:

- Be in potential conflict with future infrastructure in the reserved CBD Metro corridor. The corridor includes an underground metro station between Darling Street and Wellington Street, immediately to the east of Crystal Street
- Require relocation of a local utilities substation
- Be located within a mixed residential and light industrial zone which, given the nature of existing and historical land uses, is likely to represent a contamination risk
- Compromise the right turn from Victoria Road into Terry Street, which is a significant local traffic movement
- Result in portals further south along Victoria Road which would reduce the desirability of the Iron Cove Link as an alternative route option for motorists and potentially impact traffic flow.

The preferred portal location to the east of Terry Street would maintain the right turn access to Terry Street, allow for a pedestrian crossing across Victoria Road and avoid an additional set of traffic lights on Terry Street.

Access to and from Terry Street would be maintained as existing on completion of the Iron Cove Link via the realigned Victoria Road. The existing arrangements are shown in Figures 5-39 and 5-40 of the EIS.

The section of Manning Street between Byrnes and Callan streets is two-way and would not be affected by the project. The one-way section of Manning Street to the east of Callan Street is narrow and is not proposed to be widened for use by the project. Changes to local traffic management, other than those proposed as part of the project, are the responsibility of the Inner West Council.

The extension of the Iron Cove Link further along Victoria Road would be associated with interfacing issues with the Gladesville Bridge.

C4.12 Active transport options

134 submitters raised concerns about active transport options considered. Refer to section 13.5 of the EIS for details on active transport links assessed for the project.

C4.12.1 Active transport links at Rozelle

Submitters were concerned by the proposed active transport routes at Rozelle and made various suggestions on alternate routes to be considered. Specific issues include:

- Concern about lost access through Buruwan Park and loss of the at-grade link at The Crescent with the alternative route taking no account of the topography
- Concern over the removal of Beatrice Bush Bridge over Victoria Road
- Suggest the project must deliver separate active transport projects around Rozelle
- Suggest more underpasses and overpasses are incorporated for greater access, specifically an overpass or underpass at Terry Street and at Darling Street across Victoria Road
- Objection to the replacement of the pedestrian overpass of Victoria Road near Lilyfield Road with an underpass, as people feel safer on a bridge in public view and the underpass involves a lengthy detour

- Reuse of the existing Beatrice Bush Bridge over Victoria Road at the northern approach of the Gladesville Bridge to remove a convoluted cycle route there
- Remove the hairpin turn at the proposed pedestrian and cycle bridge between Rozelle Rail Yards and Railway Parade
- A continuous shared path that crosses Toelle and Callan streets along Victoria Road should be provided
- Removal of the shared path over Anzac Bridge rerouting pedestrians and cyclists over the new shared path on the old Glebe Island swing bridge
- Reinstate the Glebe Island Bridge as an active transport only link
- Direct pedestrian links over Rozelle Rail Yards to the Rozelle Bay and Leichhardt light rail stops should be considered.

A number of submitters support the linking paths over The Crescent and City West Link and the connectivity from Lilyfield Road along the Rozelle Rail Yards, under Victoria Road and to the proposed open space at the Rozelle interchange.

Response

An active transport strategy has been developed for the project and is provided in full in Appendix N (Technical working paper: Active transport strategy) of the EIS. The active transport strategy was developed in consultation with stakeholders and through analysis of current and proposed active transport routes and relevant active transport policies and guidelines.

The M4-M5 Link project includes the development of new or improved active transport links in a number of locations, generally associated with surface works and/or residual land for the project. These would improve north-south and east-west connectivity and link communities that are separated by the Rozelle Rail Yards, major roads such as City West Link, The Crescent and Victoria Road. Proposed active transport links are summarised in **section C4.3.1**.

The active transport suggestions raised by submitters would be considered further during the development of the detailed design.

The existing bridge over Victoria Road east of the intersection with City West Link (identified as ‘Beatrice Bush Bridge’ by submitters) would be removed for widening and adjustments of Victoria Road between The Crescent and Anzac Bridge as part of the Rozelle surface works. The existing bridge provides pedestrian and cyclist connectivity to Lilyfield Road (via a separate pedestrian overpass to the north) and Anzac Bridge over Victoria Road from the shared path located to the south of City West Link towards The Crescent. The bridge would be replaced by:

- A new east-west pedestrian and cyclist underpass below Victoria Road to connect Lilyfield Road with the opposite side of Victoria Road, Anzac Bridge and The Bays Precinct. This new link would offer improved visual amenity and safety and would remove the existing bridge structure over Victoria Road in the vicinity of White Bay Power Station
- North-south pedestrian and cyclist connections over City West Link via two new pedestrian and cyclist bridges over City West Link to connect Lilyfield Road and Easton Park with Brenan Street at Lilyfield and The Crescent at Annandale.

At the Iron Cove Link, the project would include a pedestrian path connecting Toelle and Terry streets (via a signalised pedestrian crossing), similar to the existing arrangement, with a larger pedestrian refuge in the middle of Victoria Road. An underpass is not feasible at this location because of the cut-and-cover structures for the Iron Cove Link tunnel portals in the middle of Victoria Road. An overpass would require long ramps on either side of Victoria Road in areas where space is limited and may also result in visual impacts in combination with other project infrastructure.

Around The Crescent, while Buruwan Park would be removed for the project, the active transport link between The Crescent and Railway Parade under the light rail bridge would be retained. The link along the west side of The Crescent and connection to the light rail stop would be retained and a connection would be provided to the new active transport bridge which crosses City West Link and The Crescent. Connection to the Glebe Foreshore and Victoria Road/Anzac Bridge that currently exists from the active transport routes at Buruwan Park would be provided through the new land bridge between Rozelle Rail Yards and The Crescent and shared path along The Crescent. The shared path would provide a suitable cycling space for the connection along The Crescent into Jubilee Park and linking to the existing Glebe Foreshore.

A number of the active transport suggestions identified by submitters are outside the scope of the project. See Appendix N (Technical working paper: Active transport network) of the EIS for further information about potential future active transport links that would delivered by others as separate projects, subject to separate environmental assessment.

The support for the proposed active transport links at Rozelle is noted.

C4.12.2 Other options for active transport

Submitters were concerned by the lack of active transport links and routes in the project in general. Submitters suggested the following be considered as adjustments to existing designs or additions:

- Increase areas of active transport infrastructure to be delivered by the project
- Suggest a general increase in connections between local roads and shared user paths to promote walking and cycling
- General support for the Active Transport Strategy but more active transport should be provided
- The project should deliver various separate active transport projects around the project footprint
- Suggest a commitment to take responsibility for delivering improved active transport as part of the project, by either directly delivering, or providing the resources and funding to construct the identified active transport projects
- All new shared paths and cycle ways should be built to Austroads standards.

Response

An active transport strategy has been developed for the project and is provided in full in Appendix N (Technical working paper: Active transport strategy) of the EIS. The M4-M5 Link project includes the development of new or improved active transport links in a number of locations, generally associated with surface works and/or residual land for the project, particularly focused on areas at Rozelle and Iron Cove. The new links would significantly improve connectivity between communities and would also provide improved amenity and safety for users. All shared paths and cycle ways would be developed in accordance with relevant standards. The active transport links proposed for the project are outlined in **section C4.12.1**.

A number of the active transport suggestions identified by submitters are outside the scope of the project. See Appendix N (Technical working paper: Active transport network) of the EIS for further information about potential future active transport links that would delivered by others as separate projects, subject to separate environmental assessment.

C4.12.3 Active transport links at St Peters

Submitters were concerned about proposed active transport routes at St Peters and surrounds and made various suggestions on alternative routes to be considered including:

- The project should connect the Alexandra Canal shared path with the M5 East bike route
- A cycle link is needed from Bedwin Road/Enmore Road to Cooks River.

Response

Appendix N (Technical working paper: Active transport strategy) discusses the M5 East Green Link and notes there is poor connectivity between frequently used existing routes including the Cooks River shared path, the M5 East Linear Park and the Alexandra Canal cycle path. A condition of approval of the New M5 project was to prepare a pedestrian and bicycle network review to identify additional pedestrian and cycling infrastructure that could be developed in a one-kilometre radius of the St Peters interchange.

Active transport links at St Peters (in the areas the submissions are referring to) would therefore be delivered by the New M5 project to improve connectivity in this area, including new bridges, shared paths and cycle paths. This is discussed further in section 4.1.3.2 of Appendix N (Technical working paper: Active transport strategy) of the EIS. The project is not proposing additional active transport links at St Peters beyond those being delivered by the New M5 project.

C4.12.4 Active transport links at Haberfield

Submitters were concerned by the proposed active transport routes at Haberfield and surrounds, and made various suggestions on alternative links and infrastructure to be considered, including:

- Links across Wattle Street/City West Link between Haberfield and Five Dock should be improved
- More pedestrian/cyclists crossings should be implemented across Parramatta Road
- Provide cycling paths from Waratah Street, Haberfield to Ashfield Station
- Incorporate a bicycle rack at the Leichhardt North light rail stop
- Deliver the Inner West Greenway as part of the project.

Response

Active transport connections at Haberfield are outside the scope of the project. The draft M4 East UDLP outlines the active transport links to be provided in Haberfield by the M4 East project.

C4.13 Options for open space or recreation

One submitter raised issues about the considered use of open space. Refer to section 4.5 and section 4.6 of the EIS for details on avoiding use of public open space.

C4.13.1 Open space options Rozelle

A submitter supported retaining Easton Park for local recreation use.

Response

The support for retaining open space at Easton Park at Rozelle is noted.

C4.14 Options for ventilation systems

27 submitters raised concerns about ventilation facility options. Refer to section 4.6 of the EIS for details on ventilation facility options considered.

C4.14.1 Options for ventilation facility systems

Submitters raised concerns regarding the design of the ventilation facilities specifically in relation to their ventilation systems. Submitters suggested the following as options for the proposed ventilation facility systems:

- Implement transverse ventilation systems
- Concern regarding the level of research undertaken in selecting the proposed ventilation facilities stated in the EIS. Submitters believe other technological solutions are available which could circumvent the requirement of both ventilation outlets and their associated infrastructure
- Suggest a fan-driven system

- Suggest a smaller decentralised ventilation option consisting of openings along the length of the tunnel
- Tunnel emissions should be treated in tunnel
- Options should be investigated to reduce the height of the ventilation outlets.

Response

A number of options and technologies for the project ventilation system were considered including options related to:

- Ventilation system design
- Ventilation outlets and portal emissions
- Ventilation facility locations.

These options are considered in section 4.6.1 of the EIS.

A transverse ventilation system design was considered for the project. This option would involve providing fresh air inlets along the length of the tunnel along one side, with outlets on the opposite side to ensure adequate dilution of emissions is to. This system requires two large ducts to be constructed along the length of the tunnel, one for the fresh air supply and one for the exhaust air. Transverse ventilation has been used in the past when vehicle emissions produced greater levels of pollutants than they do today. A transverse ventilation system is more expensive to construct because of the additional ducts that need to be excavated for each tunnel. This type of system is less effective than a longitudinal system for controlling smoke in the tunnel in case of a fire. It is also more energy intensive as more power is consumed to manage air flows.

A longitudinal system with elevated ventilation outlets has therefore been selected as the preferred option for the project, and the other tunnel projects forming part of the WestConnex program of works, for the following reasons:

- It is less costly to construct and operate than transverse systems
- It is able to ensure emissions are dispersed and diluted so that there is minimal or no effect on ambient air quality
- It is more effective for the management of smoke in a tunnel in the event of a fire
- It is able to meet the requirement to minimise portal emissions, as far as practicable.

A smaller, decentralised ventilation option consisting of openings along the length of the tunnel would not be appropriate for the longitudinal ventilation system and would involve additional property acquisition along the mainline tunnel alignment. The longitudinal ventilation system uses fans to transport air through the tunnel towards ventilation outlets (refer to section 5.8.2 of the EIS). Filtering of the ventilation outlets is discussed in **Chapter C9** (Air quality) and **section C4.15.1**.

All road tunnels longer than one kilometre built in Australia in the last 20 years have been designed and operated with longitudinal ventilation systems. This includes the NorthConnex, M4 East and New M5 tunnels, which are all approved and under construction.

The main considerations in relation to the design and location of ventilation facilities include minimising local air quality impacts on nearby receptors, maximising the operational efficiency of the tunnel ventilation system and meeting aviation safety requirements. For the ventilation outlets proposed for the M4-M5 Link, including the outlets at Rozelle and Iron Cove, the height, diameter and number of the outlets was primarily determined by the volume of air to be expelled (which is calculated based on tunnel width and length) and project air quality objectives. Refer to **section 5.10.1** for further information regarding the height of the ventilation outlets.

C4.15 Options for ventilation outlets and portal emissions

1,270 submitters raised concerns about ventilation outlet locations. Refer to section 4.6 of the EIS for details on locations considered for ventilation outlets.

C4.15.1 Unfiltered ventilation systems

Submitters raised concerns regarding the quality of unfiltered ventilation systems and why the project cannot provide filtered ventilation systems specifically for particulate matter less than or equal to 2.5 micrometre (μm) diameter ($PM_{2.5}$). Submitters requested that all ventilation facilities be filtered and fully compliant with all relevant standards. The following concerns were raised in submissions:

- Concern that the reason filtered ventilation facilities are not being used on the project is due to increased government costs and this is not acceptable given the overall cost of the project
- Japan and other countries in Europe have filtered ventilation systems for their road tunnels, which could possibly be a less expensive option
- Concern that the selection of unfiltered outlets has been done so under biased advice
- Emissions should be filtered because this would only require minor additional costs for the project
- The government and Roads and Maritime should urgently review their policy of support for unfiltered ventilation facilities which ignores international best practice
- Not enough research has been done by the NSW Government on the ongoing effects of unfiltered ventilation outlets in and around areas that have them.

Response

The assessment of the need for filtration determined that there is no beneficial impact on air quality by implementing tunnel air filtration (refer to section 9.2.3 of Appendix I (Technical working paper: Air quality) of the EIS). The assessment demonstrated that any predicted impact on local air quality due to emissions from the ventilation outlets would be very small. Specifically the following:

- Under expected traffic conditions, the predicted contribution of tunnel ventilation outlets to pollutant concentrations was negligible for all receptors including at highly populated suburbs (Haberfield, Rozelle, Iron Cove, St Peters, Birchgrove) and schools
- Filtration would not remove 100 per cent of pollutants and does not remove all pollutant types
- The assessment of filtration concluded that filtration would not materially reduce annual $PM_{2.5}$ concentrations. If outlet emissions were eliminated, the largest reduction in annual average $PM_{2.5}$ concentrations that people breathe would be 0.25 $\mu g/m^3$; with the reduction at most locations significantly less than this. A change in concentration of this magnitude would not be able to be reliably detected in ambient monitoring
- Including filtration in the ventilation facilities would result in no material change in air quality in the surrounding community when compared to the current project ventilation system and outlet design
- Any predicted changes in concentration were driven by changes in the traffic volumes on the modelled surface road network, not by the tunnel ventilation outlets.

Very few tunnels around the world (new or under construction) are equipped with air treatment systems. Out of the tens of thousands of kilometres of tunnels in the world, there are around 75 installations of electro-static precipitators to remove particulate matter, although many of them have not been activated. There are five installations of de-nitrification systems to remove nitrogen dioxide (NO_2). Evidence to date suggests that the effectiveness of such controls when applied to road tunnels is limited to specific situations and that the technologies are rarely used. A French Government review of international tunnel air treatment, updated in December 2016[3], stated:

[3] http://www.cetu.developpement-durable.gouv.fr/IMG/pdf/cetu_di_traitement_de_l_air-en-19_07_2017.pdf

'…recent tunnel projects often propose the use of air treatment systems in response to concerns expressed by local populations, who have reason to be worried about changes in their environment. Before turning to systems that may effectively provide an answer to a local pollution concern, conventional ventilation techniques (using fresh airflows to dilute pollutants) should still be considered by making use of the appropriate means, i.e. playing on the airflows and concentrations of the discarded vitiated air, as well as on the location and configuration of discharges and any other method likely to improve the dispersion of pollution and so protect the most at-risk areas.'

'…several tunnels that have been equipped with electrostatic filters have subsequently used them very little...'

This is consistent with the Victorian Minister for Planning's recent determination for the Westgate Tunnel project which stated:

'I am not persuaded that requiring immediate installation of filtration equipment in the tunnels ventilation systems is justified or cost-effective, or will even deliver a measurably better outcome. Unless a better environmental outcome can be expected, requiring such a measure would be an expensive gesture, distracting both investment and attention from better, and better-targeted, measures'.

The NSW Government routinely reviews international best practice on tunnel ventilation systems, however, Roads and Maritime is not aware of any specific government policy on filtration. The Advisory Committee on Tunnel Air Quality (ACTAQ) technical paper on the approach to ventilation systems (TP04: Road Tunnel Ventilation Systems Roads and Maritime 2014) can be found on the Chief Scientist's website[4].

It has been shown that control of pollutants at the source, ie vehicle emissions controls, is significantly more effective in improving local and regional air quality (ACTAQ 2014), National Health and Medical Research Council (NHMRC) (2008)). The NSW Government is committed to continuing to work with the Australian Government to implement cleaner fuels and cleaner vehicles, hence reducing emissions at source. Total emissions from the Sydney vehicle fleet have reduced over the last 20 years and are projected to continue to reduce into the future.

C4.16 Options for ventilation facilities locations

1,724 submitters raised concerns about ventilation facility location options. Refer to section 4.6 of the EIS for details on ventilation facilities options.

C4.16.1 Ventilation facility locations near sensitive receptors

Submitters suggested that all ventilation facilities, particularly as they are unfiltered, should be located away from sensitive receptors, such as schools, child care centres, open spaces and densely populated residential areas, including high rise buildings. Specifically, submitters had concerns about the following sensitive receptors:

- Residents living at Lilyfield, Annandale, Rozelle, St Peters and Glebe due to the higher topography of these suburbs. Submitters specifically noted that the surrounding schools and residents are located at elevations above the ventilation outlets
- Residents living at Lilyfield, Annandale, Rozelle, Haberfield and Glebe due to the higher residential density of these suburbs
- Rozelle Rail Yards, as high density housing and parklands are planned for the space
- Rozelle Public School, Balmain Secondary Campus, Balmain Shores Complex, Haberfield Public School, St Peters Primary School, Orange Grove Primary School, Forest Lodge Public School, North Annandale Public School and Sydney Secondary College
- Nearby childcare centres
- General recreational areas and parks within Rozelle and Lilyfield as well as the playing fields near St Peters interchange

[4] http://www.chiefscientist.nsw.gov.au/reports/advisory-committee-on-tunnel-air-quality

- The Sydney Airport flight path due to Sydney's north easterly winds carrying the increased air pollution from the ventilation facilities
- Users of the Bay Run near the Terry Street [Iron Cove Link] ventilation facility.

Submitters also requested the following relocations of the ventilations facilities:

- Relocate all ventilation facilities to the Rozelle Rail Yards
- Relocate ventilation facilities away from Victoria Road and Terry Street and 500 metres away from the Rozelle Public School and the dense residential community of Rozelle, to industrial areas rather than residential areas
- Relocate the ventilation facilities at the Rozelle interchange to be located close to the water treatment facilities to maximise open space
- Relocate ventilation outlets to Drummoyne.

A submitter suggested that the Rozelle ventilation facility and outlets should be underground.

A number of submitters believed the exact locations of the proposed ventilation facilities were not adequately captured in the EIS and requested more information.

Response

Proposed ventilation outlets for the project include the:

- Rozelle ventilation facility at Rozelle
- Iron Cove Link ventilation facility at Rozelle
- Campbell Road ventilation facility at St Peters
- Parramatta Road ventilation facility at Haberfield (built as part of the M4 East project).

The locations of ventilation facilities for the project were influenced by the design of the approved M4 East and New M5 projects. Both of these projects take into account the development of ventilation facilities for the M4-M5 Link by providing space in their respective project footprints for the development of these facilities. The construction of the ventilation facility at Haberfield (the Parramatta Road ventilation facility) that would be shared by the M4 East and M4-M5 Link projects was approved and is being constructed as part of the M4 East project, however the fitout and use of the M4-M5 Link section of the ventilation facility is subject to assessment and approval through the M4-M5 Link project. At St Peters, the Campbell Road ventilation facility would be located at the northern end of the project footprint of the New M5 project at the St Peters interchange; however the approval for the construction, fitout and operation of a new ventilation facility for the M4-M5 Link is subject to assessment and approval through the M4-M5 Link project. Locating ventilation facilities within the project footprints of the preceding WestConnex projects minimises land acquisition requirements and streamlines the design and construction process for the M4-M5 Link.

For a longitudinal ventilation system, as proposed for the project, the ventilation outlets should ideally to be located close to the end of the tunnels, before the exit portals, to ensure maximum effectiveness. The location of sensitive receivers and local topographical conditions are also considerations in the siting (and height) of ventilation outlets, as outlined in further detail in section 4.6.1 of the EIS.

The Rozelle ventilation facility (including the three ventilation outlets) would be located within the Rozelle interchange at the Rozelle Rail Yards. The outlets would be located near the end of the tunnels before the exit portals (as required for longitudinal ventilation systems) and is on government owned land that is currently disused and inaccessible to the public. This infrastructure cannot be located below ground due to the Rozelle interchange tunnels. Further, the emissions need to disperse at height to meet ambient air quality criteria.

A number of locations within the Rozelle Rail Yards were considered, having regard to a range of criteria, including the location relative to the tunnels, ramps and surface connections, other infrastructure, urban design principles, residential receivers and potential impacts on air quality. As outlined in **section C4.9.1**, high density mixed housing at the Rozelle Rail Yards as identified in *The Bays Precinct Transformation Plan* has been superseded by the NSW Government announcement in July 2016 to build the Rozelle interchange and deliver up to 10 hectares of open space at the Rozelle Rail Yards. Should the project not be approved, it is likely the land would be developed in line with the vision outlined in *The Bays Precinct Transformation Plan*.

While some of the suburbs surrounding the Rozelle Rail Yards are at a naturally higher elevation, this has been factored into the ambient air quality dispersion modelling from the outlets. Sensitivity testing was undertaken for these outlets (ie different heights) to determine the impact of the outlet on local air quality. The resulting outcome is outlets of around 35 metres above ground level would provide optimum performance in respect to air quality dispersion. Given that the air is exhausted at speed and the plume rises due to its velocity and because it is generally warmer than the outside air, the effective height for dispersion is higher than the outlets. The dispersion modelling indicates that the contributions to ground level concentrations of pollutant due to the outlets at these locations and heights would be negligible. Any predicted changes in the concentration of pollutants would be as a result of forecast changes in the surface road traffic.

Two locations were identified for the Iron Cove Link ventilation facility. On the southern side of Victoria Road, the outlet would be close to residences at Springside Street. The preferred option for the ventilation outlet at the Iron Cove Link ventilation facility would be located in the centre of Victoria Road to increase the distance of the ventilation outlet from residences and to provide a more optimal urban design solution by creating a feature in the Victoria Road corridor and the local landscape. As the outlet needs to be near the Iron Cove Link exit portals near Terry Street, it would not be feasible to relocate it to the Rozelle Rail Yards or other industrial areas.

Two options were identified for the Campbell Road ventilation facility, a combined underground and surface facility, and an above ground facility, both of which would have a ventilation outlet of around 22 metres above ground level. The above ground facility is the preferred option assessed in the EIS; however, both options would be subject to further engineering investigation and design (see section 4.6.1 of the EIS).

The project ventilation outlets have been designed to meet the requirements of the Civil Aviation Safety Authority to avoid impacts to aircraft flying to and from Sydney Airport.

C4.17 Construction options

2,163 submitters raised concerns about construction options. Refer to section 4.6 of the EIS for details on construction options.

C4.17.1 Darley Road civil and tunnel site (C4)

A number of submitters objected to the Darley Road civil and tunnel site, stating that the site is opposed by Inner West Council and traffic planners. Submitters raised a number of concerns regarding suitability of the Darley Road civil and tunnel site at Leichhardt. These include:

- Lack of justification for the Darley Road civil and tunnel site as the EIS omits a number of alternative sites that were considered in Leichhardt and Lilyfield
- The EIS does not provide an adequate explanation as to why alternatives for spoil haulage, such as directly onto City West Link, have not been included in the EIS
- The site is not suitable given that previous development applications at this site have been rejected or approved with strict conditions
- Concern with the close proximity of the Darley Road civil and tunnel site to St Columba's Catholic Primary School which may impact students travelling to and from the school
- Close the section of Darley Road along the existing Dan Murphy site during the construction of the project. During construction this can be utilised as parking and storage for the site
- The location of the Darley Road civil and tunnel site (C4) benefits the contractor with a lack of regard for residents
- Alternatives have been identified which provide adequate worker parking and the proponent has not given an adequate explanation as to why these alternatives have not been included in the EIS
- The location of the substation and water treatment plant on the Darley Road site
- Submitter suggests further investigation for choosing Rozelle Rail Yards for the purpose of tunnelling works instead of the Darley Road site
- Submitters did not believe that the Darley Road site was a suitable location for a construction ancillary facility due to various potential impacts, such as traffic, noise and contamination issues.

Submitters are also opposed to the entrance into the Darley Road site from Darley Road and suggest the following alternative access points for construction vehicles:

- Site should be accessed via the westbound lanes of City West Link and a new ramp on Canal Road/Charles Street to further reduce local impacts.

A submitter objected to the use of Derbyshire Road as an alternative to Darley Road for the civil and tunnel site.

A submitter expressed support for the limitation on hours for spoil haulage proposed for the Darley Road site.

Response

Section 4.6.2 of the EIS outlines the criteria considered in locating the construction ancillary facilities.

The Darley Road civil and tunnel site (C4) is one of 12 ancillary facility sites described and assessed in the EIS. The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design and would meet the environmental performance outcomes stated in the EIS and the Submissions and preferred infrastructure report and satisfy criteria identified in any relevant conditions of approval. For a tunnel project of this scale, mid-tunnelling construction sites such as the Darley Road civil and tunnel site (C4) are important in supporting efficient delivery of the tunnel construction works, thereby reducing the overall construction program duration.

The Darley Road civil and tunnel site (C4) is considered to be an appropriate site as it is located in relatively close proximity to the mainline tunnel alignment on land owned by the NSW Government, which would mean further property acquisition is not required. The site also has access to the arterial road network (City West Link) and Darley Road, which is a designated State road.

Four alternative sites at Leichhardt were considered during the concept design development for the project functions provided by the Darley Road civil and tunnel site (C4) including City West Link, Blackmore Park, Moore Street and Derbyshire Road. The rationale for excluding these alternative sites is provided in Table 4-7 of the EIS.

St Columba's Catholic Primary School is located around 200 metres to the south of the Darley Road civil and tunnel site (C4). All pedestrian connections to the light rail stop would be maintained, traffic control will manage pedestrian movements across the heavy vehicle entry and exit driveways to the construction site and the existing pedestrian traffic lights on Darley Road would be maintained.

The option of using City West Link for access to the Darley Road civil and tunnel site was investigated (see **section B11.6.9** for further information). While this option would remove heavy vehicle spoil traffic from Darley Road, it was not supported for the following reasons:

- Creating new access points from and to City West Link with associated heavy vehicle diverge and merge movements would create traffic safety issues
- Use of this new access arrangement would require building of structures, including the option of building a conveyor over the light rail corridor to deliver spoil into trucks. This may result in safety issues for light rail users and may not be acceptable to Transport for NSW
- Building structures over the light rail corridor would potentially create a new elevated noise source and would also be visually prominent
- The new access arrangement may impact on an existing service corridor for the light rail corridor which is accessed from Charles Street
- The new access arrangement would conflict with existing pedestrian paths which connect to the light rail stop from Charles Street and from the pedestrian bridge over City West Link
- The new access arrangement would potentially impact on existing traffic movements along Canal Road and Charles Street
- The new access arrangement would require existing noise walls along the south side of City West Link to be modified, potentially impacting on their effectiveness
- The new access arrangement would require the removal of existing vegetation adjacent to the light rail corridor and along the Canal Road and Charles Street road reserves.

The suggestion to close a section of Darley Road during construction would not be feasible as it is a designated state road which carries around 16,000 average two-way vehicle movements per day and which provides an important connection to City West Link. Redirecting this level of traffic to alternative routes in the local area over the four year construction period would not be reasonable.

A substation and water treatment plant is required at this location to service mid-tunnel power and water treatment requirements for the operation of the project.

An additional construction ancillary facility (the White Bay civil site (C11)) is proposed near White Bay at Rozelle, on land owned by the Port Authority of NSW. The facility would provide a truck marshalling area that would primarily service the mainline tunnelling sites at Haberfield and Ashfield, Darley Road and Pyrmont Bridge Road, where space for truck queuing on-site is limited. The site would also provide additional construction workforce parking spaces (around 50 spaces), which would assist in minimising the loss of parking on local streets. To make use of the parking availability at these facilities, shuttle bus transfers would be provided to transport workers to other sites which do not have spare parking capacity. This would alleviate parking demand at other sites and further reduce parking impacts identified in the EIS. See **Chapter D2** (White Bay civil site (C11)) for further information regarding the White Bay civil site (C11).

Potential impacts and management measures at the Darley Road civil and tunnel site (C4) including traffic, noise, vibration and contamination are assessed in the EIS and discussed in **Chapters C8** (Traffic and transport), **C10** (Noise and vibration), **C16** (Contamination) respectively.

The Construction Traffic and Access Management Plan for the project would include a car parking strategy construction staff at the various worksites and ancillary facilities, including at Darley Road. See **Chapter E1** (Environmental management measures) for further information.

The support for the proposed spoil haulage hours at the Darley Road civil and tunnel site (C4) is noted.

Refinement of the design at the Darley Road civil and tunnel site (C4)

Consultation with the community and key stakeholders on the concept design for the M4-M5 Link has been carried out prior to and during the exhibition of the EIS. This feedback has highlighted concerns with the use of the Darley Road civil and tunnel site (C4) during construction in the configuration presented in the EIS. Concerns included:

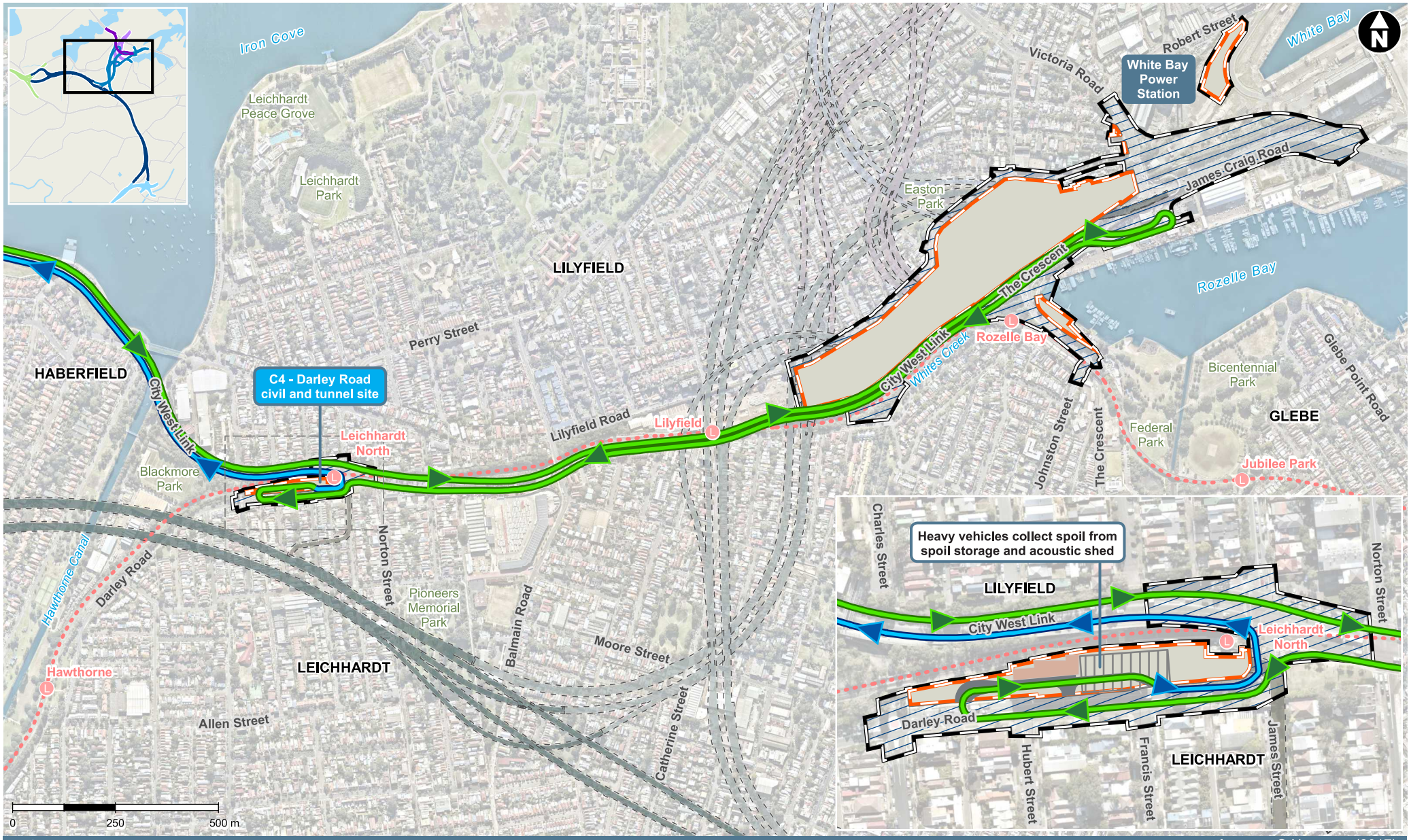
- The use of Darley Road by construction traffic (in particular trucks) and associated impacts, including:
  - Impacts on the performance of the road network, including City West Link/James Street/Darley Road intersection
  - Safety impacts on other motorists and pedestrians
  - Changes to access, including *Disability Discrimination Act 1992* (Commonwealth) (DDA) compliant access, to nearby amenities including the Leichhardt North light rail stop
- Noise impacts on nearby receivers from construction traffic and construction activities occurring within the site.

Refinement of the design of the Darley Road civil and tunnel site (C4) has been undertaken in response to the concerns outlined above and would involve:

- Changes to the haulage route for incoming construction traffic. Heavy vehicles would travel eastbound along City West Link, use James Craig Road to circle back to City West Link (westbound) and use the existing left turn into James Street. As a result the proposed right turn arrangement from City West Link into Darley Road would be removed
- Establishment of a dedicated right turn bay for heavy vehicles to enter the site from the existing westbound carriageway of Darley Road. A temporary, additional lane on the southern side of Darley Road would be established to maintain westbound traffic movements
- Increasing the acoustic performance of the acoustic shed.

The design changes would provide opportunities to reduce potential traffic and noise impacts while minimising physical changes to the EIS design. The indicative new construction haulage route is shown in **Figure C4-1**.

Further responses to potential traffic, noise and contamination impacts at the Darley Road civil and tunnel site (C4) are addressed in **section C8.2.2, section C10** and **section 16.2.2**, respectively.



LEGEND

Imagery © Nearmap (2017)

Boundaries
- Project footprint
- Ancillary facility
- Surface works

Surface construction
- Access road
- Laydown area
- Acoustic shed

Underground construction
- Rozelle interchange tunnel
- Iron Cove Link tunnel
- Mainline tunnel
- Temporary access tunnel
- Proposed future Western Harbour Tunnel and Beaches Link stub tunnels (civil construction only)

Spoil haulage route
- Inbound vehicles
- Outbound vehicles

Figure C4-1 Indicative spoil haulage route for Darley Road civil and tunnel site (C4)

C4.17.3 Construction ancillary facilities at Haberfield and Ashfield

Submitters objected to the construction ancillary facility options (Options A and B) around Haberfield and Ashfield. Reasons for the objections included:

- The full range of possible construction options in Haberfield is not clear and that the construction options may be utilised in a way that the EIS has not considered
- Concern that all five sites may be in operation simultaneously
- The assessment of Option A and Option B did not properly consider the impact of a decade long construction duration on surrounding residents
- Option A and Option B do not meet the criteria for identifying locations of construction ancillary facilities as stated in the EIS
- Both Options A and B extend construction impacts for four years and would have severe impacts on the community and should not be progressed. In particular there was concern about the close proximity of these sites to Haberfield Public School
- Option A would be preferred as it is an existing construction site and is located away from schools and day care centres
- Option B should be the preferred choice given that residents of Wattle Street have been subject to dust and noise impacts for the past two years
- Objection to the Option B site for the following reasons:
  - The site is unsuitable due to existing contamination from being a former car yard
  - The site adds new land to the project footprint and requires additional property acquisition
- The construction ancillary facilities were originally going to be located within the existing sites used for the previous stages
- A possible conveyor over Parramatta Road plus additional worker pedestrian bridges over Parramatta Road are not detailed in EIS
- Minimal or no above ground construction should occur at Haberfield and Ashfield because this was not discussed in the EIS
- The former motor registry site at Five Dock should be used for the purposes of worker parking
- In previous consultation sessions for the M4 East the public were promised only underground construction sites would be required
- Mains powered electricity should be used for the Parramatta Road construction sites and not diesel generators.

Response

As described in section 6.5.1 of the EIS, 12 construction ancillary facilities have been described and assessed in the EIS, including five sites as Haberfield and Ashfield:

- Wattle Street civil and tunnel site (C1a)
- Haberfield civil and tunnel site (C2a)/ Haberfield civil site (C2b)
- Northcote Street civil site (C3a)
- Parramatta Road West civil and tunnel site (C1b)
- Parramatta Road East civil site (C3b).

The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design and would consider the:

- General principles for construction outlined in section 6.1.1 of the EIS
- Environmental performance outcomes stated in the EIS and the Submissions and preferred infrastructure report
- Relevant guidelines including noise goals identified in the EIS

- Criteria for final construction site layouts and access arrangements as listed in section 6.5.1 of the EIS
- Environmental management measures identified in **Chapter E1** (Environmental management measures)
- Relevant conditions of approval.

The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design and would meet the environmental performance outcomes stated in the EIS and the Submissions and preferred infrastructure report and satisfy criteria identified in any relevant conditions of approval. Further, additional ancillary facilities may be proposed by the contractor, once engaged. Prior to the establishment of ancillary facilities that are not identified in this EIS, the contractor would need to satisfy criteria that would be identified in any relevant conditions of approval and in accordance with an Ancillary Facilities Management Plan.

Based on community feedback and concerns raised in submissions on the EIS, a number of refinements to the construction ancillary facilities at Haberfield and Ashfield have been made to further minimise impacts on the community and sensitive receivers. This includes:

- Wattle Street civil and tunnel site – the area at the surface currently being used as a construction zone for the M4 East project would no longer be used. Construction activities would be limited to the Wattle Street entry and exit ramps
- Haberfield civil site – footprint reduced and site to be used as a civil site only as per the arrangement for the Haberfield civil site (C2b). The C2a option would therefore not be used for the construction of the project. No tunnelling from this site is proposed.

These refinements would allow landscaping and urban design works associated with the M4 East UDLP and Residual Land Management Plan in the area around Wattle Street and Walker Avenue at Haberfield to be carried out at the completion of construction of the M4 East project.

Pedestrian bridges or other structures over Parramatta Road are not proposed as part of the project.

Section 6.5 of the EIS identifies that the construction ancillary facilities would be located above and below ground. As discussed above, the Wattle Street civil and tunnel site (C1a) has been refined and there would be no surface sites at this location, therefore a lower magnitude of impacts is anticipated than what was presented in the EIS.

Construction workforce car parking at Ashfield and Haberfield would be provided at the Northcote Street civil site (C3a) providing around 150 car parking spaces (Option A) and the Parramatta Road East civil site (C3b) providing around 140 car parking spaces (Option B). Approximately 50 car parking spaces are also expected to be provided at the White Bay civil site (C11) (see **Chapter D2** (White Bay civil site (C11)).

Potential impacts from the construction and operation of the project on communities and sensitive receivers, including the Haberfield Public School, are addressed throughout the EIS. Further responses to submissions on impacts related to sensitive receivers, including the Haberfield Public School can be found in **Chapter C8** (Traffic and transport), **Chapter C9** (Noise and vibration) and **Chapter C10** (Air quality).

Potential impacts associated with longer term construction and concerns around commitments made for M4 East that were not a part of the M4-M5 Link project are responded to and **section C14.1**. Additional mitigation measures to address longer duration impacts are outlined in **Chapter E1** (Environmental management measures).

Diesel generators may be required during the construction of the project. However, environmental management measure AQ11 (see **Chapter E1** (Environmental management measures)) stipulates that the use of mains electricity will be favoured over diesel or petrol-powered generators where practicable to reduce site emissions.

C4.17.4 Alternative construction sites

Submitters raised concerns regarding new construction sites and suggested that:

- Tunnelling should be undertaken from the established construction sites at Rozelle and St Peters after completion of the M4 East and New M5 projects so that spoil could be transported along the newly completed motorways and further acquisition of properties would not be required

- Utilise existing construction sites from Stages 1 and 2 of WestConnex for Stage 3 [the M4-M5 Link] so as to minimise costs, traffic impacts and disruption to local amenities
- Utilise Bridgewater Park as an alternative location for offices and machinery.

Response

Tunnelling from construction sites that would be established specifically for the project (ie those that haven't already been established for the M4 East and New M5 projects) has been included in the construction approach for the project in order to optimise the construction strategy for the project. The construction strategy has been prepared and assessed with the objective of reducing the overall duration of construction of the project, to minimise risk to delivery timing and impacts on nearby communities, including 'cumulative' impacts from longer term construction at Haberfield and St Peters. Given the scale of the project, tunnelling only from construction sites established for the M4 East and New M5 projects would result in an increased risk to delivery timing, construction program and impacts on nearby communities that are currently subject to the works associated with the M4 East and New M5 projects.

As mentioned in section 4.6.4 of the EIS on spoil storage, transport and disposal options, there may be an opportunity for spoil generated at the Haberfield and St Peters ends of the mainline tunnel to be transported via the completed M4 East and New M5 tunnels rather than via surface roads, where practicable. Heavy vehicles would generally be able to access preceding WestConnex tunnels to transport spoil generated:

- At the Rozelle and Darley Road sites, trucks would be able to use City West Link to access the completed M4 East tunnels at Wattle Street
- At the Pyrmont Bridge Road site, trucks would be able to use Parramatta Road to access the completed M4 East tunnels
- At the St Peters site, trucks would be able to access the New M5 tunnels at the St Peters interchange
- At the Haberfield/Ashfield sites, trucks would be able to use Parramatta Road before accessing the M4 East tunnels at the Concord interchange.

These options would be investigated further by the appointed design and construction contractor(s).

Throughout the development of the project, a number of potential construction ancillary facility sites were investigated but were excluded from the project for various reasons. These sites and the reasons they do not form part of the project are outlined in Table 4-7 of the EIS. The project has sought to minimise impact to open space areas during construction. Bridgewater Park was not considered as a potential construction ancillary facility. The site is not easily accessible from the project footprint along Victoria Road and is surrounded by high density residential development.

C4.17.5 Alternative construction methodologies

Submitters raised concerns regarding proposed construction methodologies and suggest that:

- The project should consider the new tunnelling system used in London's "Super Tunnel" (extension of London's underground railway) which uses lasers and minimises the need for property acquisition
- Mains powered electricity should be used instead of diesel generators.

Response

A number of tunnel construction methods were considered and are described in section 4.6.3 of the EIS. The tunnel construction methods were considered in the context of their suitability to local geological conditions. Different geological conditions require different tunnel construction methods and therefore tunnel construction methods that may be suitable in other locations are not necessarily suitable for the project. Tunnel construction methodology for road and rail tunnels are different because of the different tunnel dimensions and cross-sections (eg rail tunnels use tunnel boring machines and road tunnels typically use roadheader methods).

The tunnel construction methods would be confirmed by the contractors engaged to construct the project. It is anticipated that a combination of the roadheader excavation and drill and blast methods would be used for the project as that method is appropriate for the geological conditions present. Similar tunnel construction methods have/are being used on all recent tunnel projects in Sydney. Refer to Chapter 6 (Construction work) of the EIS for further information regarding the tunnel excavation methods.

The project has been designed and developed to minimise the need for surface property acquisition as described in section 4.6.2 and section 12.3 of the EIS.

Diesel generators may be required during the construction of the project. However, environmental management measure AQ11 (see **Chapter E1** (Environmental management measures)) stipulates that the use of mains electricity will be favoured over diesel or petrol-powered generators where practicable to reduce site emissions.

C4.17.6 Pyrmont Bridge Road tunnel site (C9)

Submitters objected to the Pyrmont Bridge Road tunnel site (C9). Reasons given included:

- Proximity of the site to local residents, as there is a property within 40 metres of the site boundary and large apartment complexes within 100 metres of the site
- Proximity of the site to the Bridge Road School, as a previous option considered for a M4-M5 Link construction site at Leichhardt was moved due to impacts on the adjacent Sydney Secondary College.

Response

Section 4.6.2 of the EIS outlines the criteria considered in locating the construction ancillary facilities required for the project. Two alternative sites were considered for the Pyrmont Bridge Road tunnel site (C9). These sites and the reasons for excluding them are summarised in Table 4.7 in the EIS. Proximity to sensitive receivers such as schools is just one of a number of factors considered for the location or relocation of construction ancillary facilities.

For a tunnel project of this scale, mid-tunnel construction sites are important in supporting efficient delivery of the tunnel construction works, thereby reducing the overall construction program duration. The Pyrmont Bridge Road tunnel site (C9) was selected as the preferred construction ancillary facility in the Annandale/Camperdown area as the site would be located in relative close proximity to the mainline tunnel alignment and would have access to the arterial road network (Parramatta Road).

In order to manage construction impacts on nearby residential properties (noise and dust), an acoustic shed is proposed to contain tunnelling activities. Heavy vehicles would turn left onto Pyrmont Bridge Road and as a result will not directly pass residential properties adjacent to the site.

A response to potential flooding hazards at the site is addressed in **Chapter C17** (Flooding and drainage).

The EIS provides an assessment of the potential impacts to sensitive receivers (including the Bridge Road School) during construction, for impacts including air quality (Chapter 9 (Air quality)), noise and vibration (Chapter 10 (Noise and vibration)) and traffic (Chapter 8 (Traffic and transport)).

The mitigation and management measures provided **Chapter E1** (Environmental management measures) would be implemented during construction of the project to reduce or minimise potential impacts to sensitive receivers.

C4.17.7 Iron Cove Link civil site (C8)

A submitter raised concerns regarding the location of the Iron Cove Link civil site (C8) in proximity to the Rozelle Public School.

Response

The location of the Iron Cove Link civil site (C8) was primarily influenced by the need to locate the facility within or adjacent to land which would be used for permanent operational infrastructure for the Iron Cove Link. This site was selected to support the development of the Iron Cove Link portals, ramps and ventilation facility and the associated widening of Victoria Road.

The site is located about 140 metres west of the Rozelle Public School. No tunnelling would occur from this site other than limited excavation for portals and ramps. Pedestrian/cycle access to/from the school along and across Victoria Road would be maintained.

Other submissions regarding impacts of the project on the Rozelle Public School are addressed in **Chapter C8** (Traffic and transport), **Chapter C9** (Air quality) and **Chapter C10** (Noise and vibration).

The mitigation and management measures provided **Chapter E1** (Environmental management measures) would be implemented during construction and operation of the project to reduce or minimise potential impacts on sensitive receivers.

C4.17.8 Rozelle civil and tunnel site (C5)

A submitter suggested using disused government owned land at White Bay or Glebe Island for construction parking for the Rozelle civil and tunnel site (C5), rather than acquiring properties on Lilyfield Road for this purpose.

Response

Properties along a section of Lilyfield Road are being acquired to enable the construction of the project, including the Rozelle interchange, including for use during construction as part of the Rozelle civil and tunnel site (C5).

Throughout the development of the project, a number of potential construction ancillary facility sites were investigated but were excluded from the project for various reasons. These sites and the reasons they do not form part of the project are outlined in Table 4-7 of the EIS. The following two sites were considered as alternatives to the Rozelle civil and tunnel site (C5):

- Easton Park, Rozelle
- City West Link, Lilyfield (near the corner of Lilyfield Road and Catherine Street at the Rozelle Rail Yards).

This land along Lilyfield Road would become part of the open space to be delivered at the Rozelle Rail Yards as committed to by the NSW Government (announced in July 2016) and as described in Chapter 5 (Project description) of the EIS and shown in Appendix L (Technical working paper: Urban design) of the EIS.

As described in **Chapter D2** (White Bay civil site (C11)), an additional construction ancillary facility is proposed near White Bay at Rozelle on land owned by the Port Authority of NSW. The site would be used for a truck marshalling facility and additional construction workforce parking. However parking would still be required at the Rozelle civil and tunnel site (C5) as described in the EIS.

C4.17.9 The Crescent civil site (C6)

A submitter suggested building a permanent ferry terminal for Rozelle Bay so that The Crescent civil site (C6) can use it initially, for transporting spoil via the water ways.

Response

As with rail, the main benefit of barge transport is the ability to move large volumes of spoil, while reducing the number of heavy vehicle movements on the wider road network. However, this option presents a number of issues including:

- The material would need to be double (or possibly triple) handled, as trucks would be required to move material to the barge loading facility, and potentially from the barge to its final location, if this does not have barge access
- Infrastructure upgrades would potentially be required to allow the barge loading facility to receive the material.

Notwithstanding this, further investigations would be undertaken of spoil transport options, including the potential barging of spoil, during detailed design.

C4.18 Options for other surface infrastructure locations

585 submitters raised concerns about the location of permanent operational facilities. Refer to section 5.8 and section 5.9 of the EIS for details on these facilities.

C4.18.1 Darley Road motorway operations complex (MOC1)

Submitters raised objections to the proposed permanent location of the water treatment plant and substation at Darley Road, Leichhardt due to it being in a residential area. Submitters suggested the following:

- Operational infrastructure should be moved further north of the proposed site to reduce visibility from homes
- The section of Darley Road along the existing commercial property should be closed during the operational phase of the project and used for open space or public parking for the light rail
- The land at Darley Road should be used for community purposes, such as open space.

Submitters considered that there was not adequate explanation in the EIS as to why alternatives to this site were not provided.

Response

The Darley Road civil and tunnel site (C4) is considered to be an appropriate site as it is located in relatively close proximity to the mainline tunnel alignment on land owned by the NSW Government, which would mean further property acquisition is not required. The site also has access to the arterial road network (City West Link) and Darley Road, which is a designated State road.

Four alternative sites at Leichhardt were considered during the concept design development for the project functions provided by the Darley Road civil and tunnel site (C4) including City West Link, Blackmore Park, Moore Street and Derbyshire Road. The rationale for excluding these alternative sites is provided in Table 4-7 of the EIS.

While the project would be visible by motorists travelling north on surrounding streets, views of the project from the residences would be limited as identified in the visual envelope mapping included in section 7.3.1 of Appendix O (Technical working paper: Landscape and visual impact) of the EIS.

The indicative siting of operational project infrastructure has been developed to co-locate facilities, which maximise areas of land that would be available for future development in accordance with the Residual Land Management Plan to be developed the project and the underlying zoning of the land. The siting of the operational project infrastructure at the western end of the site also allows for the remaining project land to be located nearest to the Leichhardt North light rail stop. Land not required for operational infrastructure at the Darley Road site would become remaining project land and would be rehabilitated for future development, in accordance with the Residual Land Management Plan.

There is no opportunity to move the infrastructure further to the north given the location of the adjacent light rail corridor and City West Link. The landscape works and architectural design of operational infrastructure at Darley Road would be undertaken in accordance with the relevant UDLP and the urban design principles developed for the project.

C4.19 Local roads design options

Seven submitters raised concerns about changes to surface roads. Refer to section 5.4 to section 5.6 of the EIS for details on surface works for the project.

C4.19.1 Access to local roads at Iron Cove Link

Submitters were concerned by the design of local roads at Iron Cove Link, and requested that access to the local roads adjoining Victoria Street be restricted. In particular, it was suggested that:

- Toelle Street should be modified or closed to general traffic at Victoria Road
- Callan Street and Springside Street at Victoria Road should be turned into a cul-de-sac and shared zone

- Manning Street between Moodie Street and Callan Street should be modified to a two-way street for local traffic for easier access to King George Park and surrounding streets
- Support for the cul-de-sac at the end of Clubb Street, Rozelle.

Response

The concept design in the EIS proposes that only Clubb Street be turned into a cul-de-sac. Clubb Street is to be closed because of the significant level differences with the proposed southern carriageway on Victoria Road, which is to be lowered to accommodate the Iron Cove Link portals (refer to Figure 13-33 of EIS).

However, the creation of additional cul-de-sac was considered during the development of the concept design. The traffic assessment found that additional cul-de-sac for streets such as Toelle Street, Callan Street and Springside Street at Rozelle would not be required for operational reasons, and would impact on local roads further to the east, south of Victoria Road (such as Moodie and McCleer streets). These streets provide access between the local residential area and Victoria Road. They also provide important access to King George Park. If additional roads were closed this would restrict access and force traffic to be redirected to other streets, a number of which are quite steep and narrow.

The project would not close Toelle Street at Rozelle. The Toelle Street and Callan Street intersections with Victoria Road would generally remain open during construction. There would be instances where one of these intersections would be closed temporarily to construct the permanent design, however these works would be short-term and conducted during non-peak times, where practical.

For the operation of the project, Toelle Street would be open in line with the permanent design. Toelle Street is required to remain open to provide access to Clubb Street from Victoria Road via Manning Street.

Access to King George Park would be maintained via Manning Street, Toelle Street and Callan Street. Traffic surveys carried out on behalf of SMC in October 2017 indicate that Toelle Street currently functions as the main access to King George Park. The closure of Clubb Street at Victoria Road for motorists would therefore not have a substantial impact on access to King George Park and the function of the road network along these local roads.

C4.20 Options for portals

Seven submitters raised concerns about connectivity between surface roads and the tunnel portals. Refer to section 5.3 of the EIS for details on the tunnel portals.

C4.20.1 Portal link options

Submitters raised concerns regarding the connections of the entrances and exits of the portals to the proposed motorways. Specific concerns included:

- Traffic lights near portals at City West Link should be removed to reduce interruption to traffic flow
- The Western Harbour Tunnel portal at the Rozelle interchange should be removed and replaced with an underground connection elsewhere due to potential congestion
- Location of the tunnel portals in residential areas
- The entrance to southbound tunnels should be below ground
- There should be adequate entry points to the tunnels for the local residents who will be affected by the project.

Response

The construction or modification of intersections (including traffic signals) for the project is required where free flow connections are not optimal due to design or connectivity constraints. Creating free flow connections along City West Link would require grade separation of the intersections. This is challenging because:

- The proximity of existing intersections at Victoria Road, James Craig Road and The Crescent
- If the intersection is elevated it creates potential issues with traffic noise and visual impact

- If the intersection is below ground there are geotechnical, groundwater, contamination and utility issues to consider
- Grade separation of the intersections would also likely result in a larger project footprint.

The project would involve the following intersection works:

- A connection between the New M5 and the surface road network at Lilyfield and Rozelle, via a new intersection with City West Link between Catherine Street and The Crescent
- A connection between the surface road network and the proposed future Western Harbour Tunnel and Beaches Link program of works, via the realigned intersection of City West Link and The Crescent.

The intersections would be designed to safely and efficiently manage traffic entering and leaving the surface road network and the Rozelle interchange at these locations.

Tunnel portals would be located within the road corridor for the project. Impacts associated with the operation of the tunnel portals are assessed throughout the EIS. A surface entry point is required to access a tunnel.

Local residents would readily be able to access the entry points of project.

C4.21 Other options not assessed in the EIS

Eight submitters suggested other options to the M4-M5 Link project that were not assessed in the EIS. Refer to sections 4.4, 4.5 and 4.6 of the EIS for details on the strategic alternatives, project evolution and design refinements and other project options considered.

C4.21.1 Other options not assessed in the EIS

Submitters suggested other options for the project that were not assessed in the EIS, including:

- Using money made through tolling on improving public transport in Sydney
- A coordinated scheme for road pricing throughout Sydney
- Provide location services and Global Positioning Systems (GPS) navigation within tunnels to guide users through the complexity of the Rozelle interchange tunnels
- Fines for heavy vehicles not using the M4-M5 Link tunnels as encouragement to use the M4-M5 Link
- Free usage of the project for electric vehicles, discounted usage for hybrids and a normal fee charged for conventional vehicles.

Response

The NSW Government makes decisions on budget allocations through the development of the state budget, including allocations for public transport investment. As part of this process, the NSW Government considers available and appropriate revenue streams for such initiatives.

Over the past 20-30 years, there have been a number of government policy discussion papers on a coordinated pricing scheme as an alternative pricing mechanism for Sydney. However, decisions on this matter are outside the scope of the project.

Vehicle positioning systems and hand-held navigation systems currently in use in Australia include GPS and mobile telephone systems. GPS systems are dependent on line of sight to satellites and the signal is lost on entering a tunnel. Mobile telephones rely on triangulation of cell antennae which are not provided below ground. Current telephone applications use a system of dead reckoning which may not be sufficiently accurate for navigating in complex underground structures.

SMC and Roads and Maritime are currently investigating a range of GPS and mobile phone technology options, such as the Waze beacon system, for implementation in the WestConnex tunnels. The Waze system uses a network of miniature beacons installed within the tunnels which communicate using Bluetooth enabled mobile phones and GPS head units, to provide an interactive navigation tool. The facility is available to all Bluetooth enabled equipment and is not restricted to users of proprietary hardware or software.

Wayfinding measures to facilitate connectivity in the Rozelle interchange would be developed as part of the UDLPs that would be prepared for the project. Consideration of wayfinding within the project tunnels is included throughout Appendix L (Technical working paper: Urban design) of the EIS.

It is not currently anticipated that heavy vehicles would be forced to use the M4-M5 Link or face fines. As the project would present a benefit to heavy and light freight and commercial services through the provision of an efficient motorway connection between the M4 East at Haberfield and the New M5 at St Peters, it is expected that these operators would elect to use the motorway.

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C5 Project description

This chapter addresses issues raised in community submissions associated with the description of the M4-M5 Link project in the Environmental Impact Statement (EIS). See **Chapter A1** (Introduction and background) and Chapter 5 of the EIS for further description of the M4-M5 Link project. Further refinements and clarifications to the design of the project are described in **Chapter A4** (Clarifications) and **Part D** (Preferred infrastructure report).

Contents

C5.1 Urban design and landscaping

Two submitters questioned what urban design and landscaping would occur as part of the project. Refer to section 5.2 of the EIS for further information on urban design objectives and principles.

C5.1.1 Urban design and landscaping

Submitters requested further information about the proposed urban design and landscaping changes, including:

- Details of installed barriers, vegetation or anything else proposed on the boundaries of the Rozelle Public School with Victoria Road and Wellington Street
- Detailed locations and use of open space to be provided by the project.

Submitters also questioned the timing and accountability for project landscaping.

Response

The urban design and landscape works that would be carried out by the project for new operational facilities and in areas of new open space created by the project, would be documented in Urban Design and Landscape Plans (UDLPs). Urban design and landscape works subject to UDLPs for the project would be undertaken at the following locations:

- Darley Road motorway operations complex (MOC1) (refer to section 13.5.2 of the EIS)
- Rozelle interchange including the Rozelle East motorway operations complex (MOC2) and Rozelle West motorway operations complex (MOC3), including the provision of up to 10 hectares of new open space within the Rozelle Rail Yards (refer to section 13.5.3 of the EIS)
- Iron Cove Link including the Iron Cove Link motorway operations complex (MOC4) (refer to section 13.5.4 of the EIS)
- Campbell Road motorway operations complex (MOC5) (refer to section 13.5.5 of the EIS).

UDLPs would be prepared in consultation with relevant councils, stakeholders and the community prior to the commencement of permanent built surface works and/or landscape works. The aim of the UDLPs is to present an integrated urban design for the project. The UDLPs would be consistent with the urban design principles that have been developed for the project (see section 13.2.2 of the EIS) and would be consistent with the key urban design guidelines and policies including *Beyond the Pavement: Urban Design Procedures and Design Principles* (NSW Roads and Maritime Services (Roads and Maritime) 2014a). Roads and Maritime, as the proponent for the project, would be responsible for delivering the urban design and landscaping works identified in the UDLPs. An Urban Design Review Panel will be established to provide advice and guidance regarding the UDLPs. The timing for landscaping works is identified in the construction programs outlined in section 6.5 of the EIS. Landscaping works would generally be undertaken after the completion of testing and commissioning of operational infrastructure.

A detailed review and finalisation of the architectural treatment of all permanent infrastructure including noise barriers (if required), open space and landscaping would be carried out during detailed design. The architectural treatment of structures would be guided by performance requirements, the outcomes of stakeholder and community consultation and the project urban design principles.

The landscape works and architectural design of operational infrastructure at the St Peters interchange will be undertaken in accordance with a project UDLP. The UDLP will be prepared in consideration of the UDLP for the New M5 project at this location and would seek to provide a consistent urban design for this area.

Remaining project land not subject to UDLPs for the project would be identified in the Residual Land Management Plan and rehabilitated and stabilised in preparation for the potential future use. The Residual Land Management Plan will be prepared in consultation with the relevant councils.

The closest extent of the project to Rozelle Public School would be project operational infrastructure associated with the Iron Cove Link portals and the Iron Cove Link motorway operations complex including the ventilation facility which would be located around 140 metres from the school. No operational infrastructure would be located on the boundary of the school at Wellington Street or Victoria Road. Urban design and landscaping works for the Iron Cove Link motorway operations complex (MOC4) would be subject to the preparation of a UDLP and would include the provision of new open space, including landscape works as well as revegetation, including tree planting, at key locations including:

- Around permanent operational infrastructure such as the ventilation facility
- Adjacent to pedestrian and cyclist paths
- Along the southern boundary of the land subject to the UDLP near Byrnes Street, Clubb Street and Toelle Street.

C5.2 Tunnels

146 submitters raised issues relating to details of the project tunnels. Refer to section 5.3 of the EIS for further information on the design of the project tunnels.

C5.2.1 Design of tunnels and associated features

Submitters asked for clarification on the design of the tunnels and their associated features. Specific queries included:

- Request for further information about the routes of tunnels between the Rozelle Rail Yards and Iron Cove Bridge including the exact routes and shape of the portals
- The exact location of the mainline tunnels have not been defined
- Concern about lack of information and design regarding the Inner West subsurface interchange, linking the two mainline tunnels with the Rozelle interchange and the Iron Cove Link and the streets it would affect
- Concern regarding tunnel grades greater than four per cent
- The Rozelle interchange has steep grades that will increase emissions concentrations
- General engineering concerns in relation to the underground Rozelle interchange
- There have been no deep-core samples taken to ascertain the strata layers prior to the decision to position the underground tunnels (specifically concerned about the Leichhardt area)
- The EIS does not indicate how the M4-M5 Link tunnels would interface with tunnels for the proposed Sydney Metro project, saying only that there is ‘insufficient public information available’.

Response

The concept design for the project tunnels as presented in the EIS defines a constructible concept that provides:

- A definition of property acquisition requirements sufficient to allow construction to proceed
- A general project footprint, including for construction and operation
- A clear description of the design principles, extent of impacts and impact management requirements
- A sound and clear basis for later development of the detailed design to a standard required to support project delivery.

The connectivity that would be provided by the project comprises:

- Free-flow connections (that is, a connection that does not require motorists to travel through or stop at an intersection) between:
  - The M4 East and the New M5, via the M4-M5 Link mainline tunnels
  - The M4 East and Anzac Bridge, via the Rozelle interchange

  - The M4 East and the proposed future Western Harbour Tunnel, via the Rozelle interchange (this connection would not be operational as part of the project)
  - The New M5 and the Iron Cove Link, via the Rozelle interchange
  - The New M5 and the proposed future Western Harbour Tunnel (this connection would not be operational as part of the project)
  - Anzac Bridge and Victoria Road at Rozelle, near the eastern abutment of Iron Cove Bridge (via the Iron Cove Link)
- A connection between the New M5 and the surface road network at Lilyfield and Rozelle, via a new intersection with City West Link between Catherine Street and The Crescent
- Civil construction only of a connection between the surface road network and the ramp connections to the proposed future Western Harbour Tunnel project, via the realigned intersection of City West Link and The Crescent (this connection would not be operational as part of the project).

The concept design presented in the EIS would continue to be refined where relevant to improve road network and safety performance, minimise impacts on receivers and the environment, and in response to feedback from stakeholders. The final design including detailed tunnel routes, portals and the Rozelle interchange design would be subject to further refinement during detailed design and the development of UDLPs for the project. If changes to the alignment are required, the changes would be communicated to affected landowners. Further information regarding portal design including potential portal shapes is provided in section 5.5.2 and Annexure 1 of Appendix L (Technical working paper: Urban design) of the EIS. Further information regarding the assessment of a concept design is provided in **section C2.1.2**.

The Inner West subsurface interchange would be located underground at Leichhardt/Annandale and would link with the mainline tunnels at two locations, enabling free-flow of traffic between the M4 East and New M5 motorways and the Rozelle interchange. Further detail regarding the Inner West subsurface interchange is provided in section 5.3.1 of the EIS. The construction and operation of the interchange would not require surface property acquisition above the interchange at Leichhardt or Annandale. See **section C12.5** and Chapter 12 (Land use and property) of the EIS for further information regarding potential settlement impacts to property from tunnelling and proposed measures to manage and monitor these impacts.

The tunnels would generally have grades of less than four per cent. However, isolated locations connecting to the surface road network may require short lengths of steeper grades of up to eight per cent. These grades would generally match with existing conditions on local surface roads or are required to ensure appropriate ground conditions with no direct property impacts. Impacts to traffic performance and in-tunnel air quality have been taken into account in the design for areas with grades greater than four per cent (see section 5.3.6 of the EIS).

Concerns regarding the constructability of the Rozelle interchange are addressed in **section C6.1.3**.

Geotechnical investigations were undertaken to inform the development of the concept design for the project. The investigations were undertaken at an appropriate depth to ascertain the geological conditions along the alignment of the project tunnels. Geological long sections for the project are provided in Appendix E (Geological long sections) of the EIS.

The project would potentially interface with the approved Sydney Metro City and Southwest project and the proposed Sydney Metro West project and this is discussed in section 12.3.4 of the EIS. The M4-M5 Link mainline tunnel alignment would pass beneath the approved Sydney Metro City and Southwest rail tunnels in the vicinity of Lord Street at Newtown. This interface is shown in Figure 12-32 of the EIS. At this location it is understood that the Sydney Metro tunnels are located at a depth of around 20 metres below existing ground level. In this location, the M4-M5 Link tunnels (the mainline tunnels connecting to the New M5 and the ramp tunnels connecting to St Peters interchange) are at a depth varying between around 35 and 45 metres below ground level. On this basis, it is considered that there is adequate separation distance provided between the M4-M5 Link mainline tunnels and the Sydney Metro tunnels.

Insufficient public information was available at the time of the preparation of the EIS regarding the alignment of the proposed Sydney Metro West rail tunnels to determine whether there is a direct interface with the M4-M5 Link project. This will be determined through ongoing consultation with Transport for NSW as the preliminary design for the Sydney Metro West project is developed. If required, adjustments to horizontal and vertical alignments of the M4-M5 Link tunnels can be made during the detailed design phase. Cumulative impacts from the two projects are expected to be addressed in the EIS for the Sydney Metro West project, as needed.

C5.2.2 Depth of tunnels

Submitters were concerned by the depth of the tunnels below ground level. Specific concerns included:

- Request for further information about depth of the tunnels below residences between the Rozelle Rail Yards and Iron Cove Bridge
- There is no description of the depth of the tunnel under James Street/Francis Street at Leichhardt
- Concerns about the depth of tunnelling in the areas of Annandale, Leichhardt and Rozelle
- Concern that tunnelling under Rozelle/Lilyfield would be only 10 to 15 metres under the surface of homes, and this has not been adequately explained in the EIS
- Request for details regarding the vertical alignment of the tunnels within 30 metres of a petrol station at St Peters
- Concern that the tunnel depths discussed in the EIS are not clear and don't seem to include the area above the 5.3 metre vertical clearance to allow for other infrastructure such as signage and fans.

Response

The alignment and depth of tunnels have been designed having regard to relevant technical road design requirements, the geological conditions along the alignment, the road geometry, cross-sectional dimensions of the project tunnels and to minimise surface impacts where possible. The depth of the tunnels below ground level would vary according to geological conditions and how close the tunnel is to the portals. The deepest point of the tunnel would be about 65 metres below ground level, with shallower sections approaching the interchanges and the connections to the surface road network. The indicative depths of the tunnel below ground level are shown in Figure 6-11 (mainline tunnels) and Figure 6-12 (Rozelle interchange and Iron Cove Link) of the EIS and in detail in Appendix E (Geological long-sections) of the EIS. The tunnels would generally be greater than 35 metres below ground in the vicinity of James Street and Francis Street at Leichhardt.

Tunnels of depths less than 20 metres below ground level would be constructed at Haberfield (for the Wattle Street interchange), Lilyfield and Rozelle, north of the Rozelle Rails Yards (for the Rozelle interchange), and at St Peters, as shallow tunnelling is required to integrate tunnels with the surface road network at Wattle Street, City West Link and Anzac Bridge, Victoria Road for the Iron Cove Link and the St Peters interchange. Shallow tunnel sections at these locations were located and designed to limit surface impacts and provide a buffer between residential areas and the surface interface of the tunnel.

The petrol station identified near Sydney Park is over 90 metres from the indicative mainline tunnel alignment presented in the EIS. The tunnel would be located at a depth of 20 metres to 35 metres below ground level at the closest point to the petrol station and is therefore not expected to impact on or be impacted by the petrol station (refer to Figure 6-11 of the EIS).

The depth of the tunnels as described in the EIS is measured from the ground surface level down to the highest vertical extent of the tunnel and takes into account infrastructure located above the 5.3 metre vertical clearance for vehicles (refer to Figure 5-14 to Figure 5-16 of the EIS).

See **section C12.5** and Chapter 12 (Land use and property) of the EIS for further information regarding potential settlement impacts from tunnelling.

C5.2.3 Emergency and breakdown facilities

Submitters were concerned about access to emergency escape points and breakdown facilities in case of a traffic incident, specifically within the Rozelle interchange tunnels.

Response

The tunnels, including the Rozelle interchange tunnels, would include vehicular cross-passages to allow for traffic to be moved from one tunnel into another in the case of an emergency. The tunnels would also include pedestrian cross-passages spaced at a maximum of 120 metres apart that would provide emergency pedestrian egress between tunnels in the event of an emergency. Cross-passages would connect to the adjoining tunnel, providing access to a non-incident zone during an emergency. Connections between the tunnels would cater for egress for people with disabilities by minimising stairs or ramps with steep grades and providing alternative safe holding zones. An indicative cross-passage layout is shown in **Figure C5-1**.

The project would also include longitudinal egress passages along the entry and exit ramps, to allow pedestrians to exit the tunnel and ramps in the event of a major incident.

Breakdown bays would be spaced around 2.5 kilometres apart and would be large enough to allow a B-double vehicle to pull over into the bay and safely park outside of the nominal tunnel shoulder width away from operational traffic lanes and without blocking traffic flow. The Rozelle interchange tunnels would be widened at this location to accommodate the breakdown bay outside of the shoulders. Breakdown bays would not be required in the Iron Cove Link tunnels due to the short distance of these tunnels. An indicative layout of a mainline tunnel maintenance and breakdown bay is shown in **Figure C5-2**.

Once the M4-M5 Link is constructed, a single entity would undertake operations for the widened M4 Motorway, M4 East, New M5, M5 East, and M4-M5 Link from a combined motorway control centre at the St Peters interchange. This motorway control centre would monitor traffic and provide for coordinated normal and emergency operations across the motorway (including the M4-M5 Link, the New M5 Motorway, the King Georges Road interchange, the widened M4 Motorway and the M4 East Motorway).

Incident Response Plans will be developed by the operator as part of the Emergency Response Plan for the project and implemented in the event of an accident or incident. The response to incidents within the motorway will be managed in accordance with the memorandum of understanding between Roads and Maritime and the NSW Police Service, NSW Rural Fire Service, Fire and Rescue NSW and other emergency services. Incident response bays would be located in close proximity to the tunnel portals to enable efficient access by motorway emergency response vehicles to the project tunnels in the event of an incident.

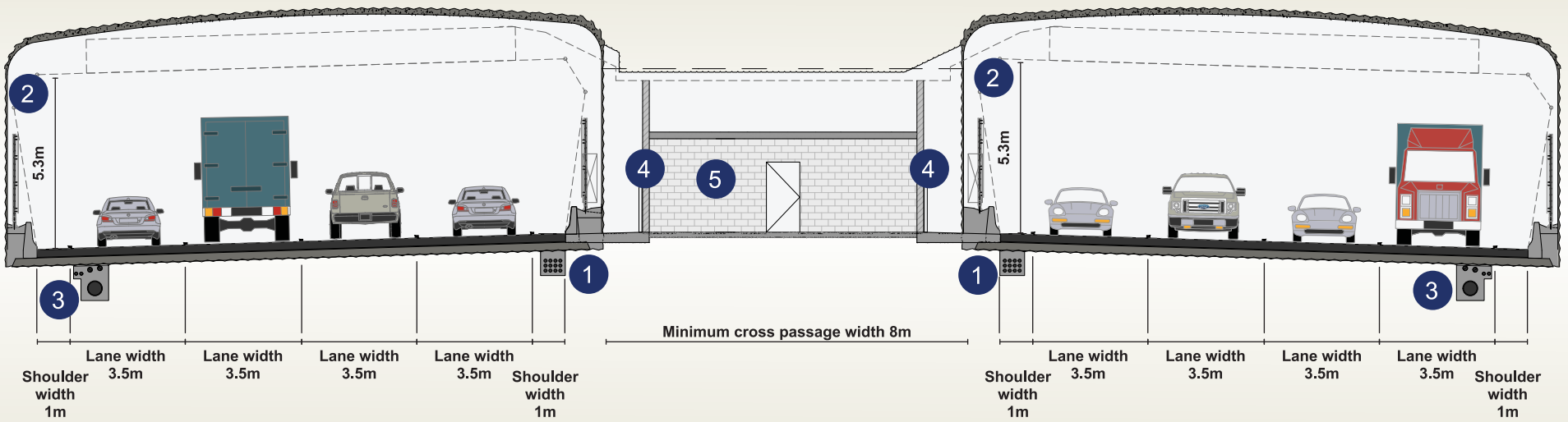
C5.2.4 Access to GPS navigational technology within the tunnels

Submitters expressed concern that access to Global Positioning Systems (GPS) navigational technology would be restricted within the tunnels, limiting drivers' abilities to navigate to their chosen destinations. This was noted to be of particular concern given the travel distance between suburbs and locations serviced by the broader WestConnex program of works.

Response

Vehicle positioning systems and hand-held navigation systems currently in use in Australia include GPS and mobile telephone systems. GPS systems are dependent on line of sight to satellites and the signal is lost on entering a tunnel. Mobile telephones rely on triangulation of cell antennae which are not provided below ground. Current telephone applications use a system of dead reckoning (calculating the current position by using a previously determined position and estimating speed) which may not be sufficiently accurate for navigating in complex underground structures.

Sydney Motorway Corporation (SMC) and Roads and Maritime are currently investigating a range of GPS and mobile phone technology options, such as the Waze beacon system, for implementation in the WestConnex tunnels. The Waze system uses a system of miniature beacons installed within the tunnels which communicate using Bluetooth enabled mobile phones and GPS head units, to provide an interactive navigation tool. The facility is available to all Bluetooth enabled equipment and is not restricted to users of proprietary hardware or software.



LEGEND

1. Services
2. Minimum vertical clearance of 5.3 metres
3. Tunnel drainage
4. Fire - Rated sliding door
5. Pedestrian cross passage

Figure C5-1 Indicative cross-passage layout

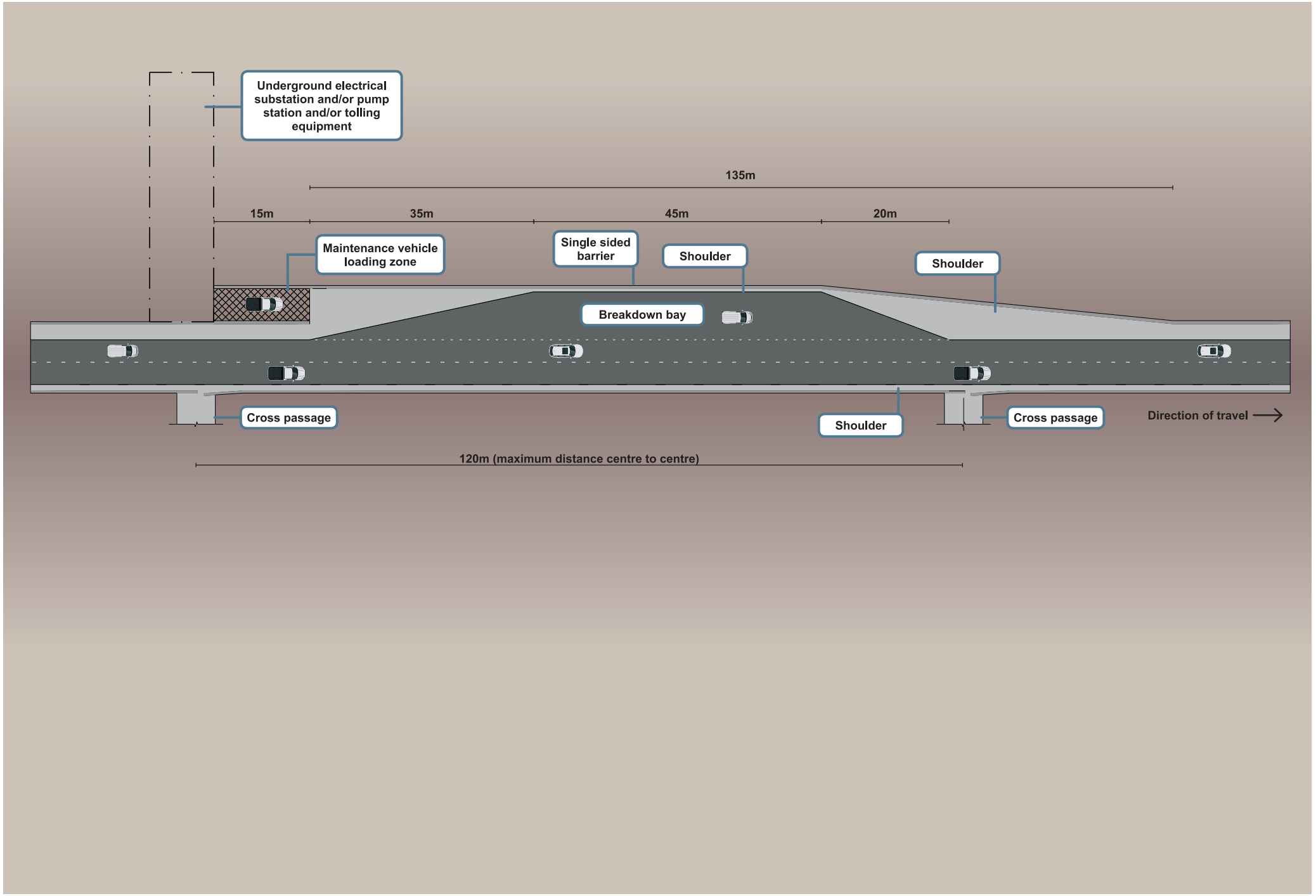


Figure C5-2 Indicative combined breakdown and maintenance bay

C5.3 Connectivity and integration

Eight submitters raised issues regarding connectivity of M4-M5 Link with other projects and other related motorway projects. Refer to section 5.5 of the EIS for further information on connectivity of the project with other WestConnex and related motorway projects.

C5.3.1 Connectivity and integration of the M4-M5 Link with the road network

Submitters raised concerns regarding the integration of the project with the existing broader transport network. Specific concerns included:

- The lack of detail in the EIS surrounding the connectivity of the Wattle Street interchange with the surrounding road network around Haberfield and Ashfield
- Lack of detail in the EIS regarding how the intersections of Terry Street and Wellington Street with Victoria Road would operate
- The lack of detail in the EIS surrounding the connectivity of the St Peters interchange with the surrounding road network around St Peters
- Lack of appropriate motorway to motorway connectivity between New M5 and Anzac Bridge
- Road connectivity between the proposed Western Harbour Tunnel travelling south and the M4-M5 Link travelling west. Lack of clarity in Figure 5-23 of the EIS
- Concern the project will not adequately connect with the Balmain Peninsula, offering no way for residents to access the tunnels locally
- The figures in the EIS provide conflicting information. Figure 5-27 shows the Iron Cove Link and M4 East to Anzac Bridge connection being an open surface road however Figure 5-21. Indicative cross-sections show this section as underground.

Response

The intersection of Terry Street and Victoria Road is shown in Figure 5-40 of the EIS. Modifications to the intersection as part of the project would consist of:

- Realignment of the signalised right turn lane from the westbound Victoria Road carriageway into Terry Street
- Tie-in works to connect Terry Street with the eastbound carriageway of Victoria Road.

While the intersection would be modified for the project, the general movement of vehicles between Terry Street and Victoria Road would be consistent with the existing operation of the intersection. The intersection of Wellington Street and Victoria Road would remain unchanged by the project.

The Wattle Street interchange and St Peters interchange are part of the M4 East and New M5 projects respectively. Vehicles travelling on the M4-M5 Link would connect to the Wattle Street interchange or St Peters interchange before connecting to the surrounding road network. The M4-M5 Link connections to the Wattle Street interchange and St Peters interchange are described in section 5.4 of the EIS.

The M4 East and Anzac Bridge connection via the Rozelle interchange has been included as part of the project to provide a motorway connection from the M4 East motorway to Anzac Bridge and further north. A motorway connection between the M5 East motorway and Anzac Bridge already exists via Southern Cross Drive and the Eastern Distributor as part of the M1 Motorway and so an additional motorway to motorway connection via Anzac Bridge has not been included in the M4-M5 Link project scope. However, the project would provide this connection on the surface road network via a new intersection along City West Link, which would enable motorists to connect between the New M5 and City West Link, The Crescent, Victoria Road and Anzac Bridge and further north. In addition, the motorway connection between the New M5 and the proposed future Western Harbour Tunnel has been included to provide a western bypass of the Sydney CBD.

The surface road configuration for the Rozelle interchange is shown in detail in Figure 5-25 to Figure 5-28 of the EIS. Connection between the surface road network and the proposed future Western Harbour Tunnel would be provided via the realigned intersection of City West Link and The Crescent. Motorists travelling from the proposed future Western Harbour Tunnel would utilise this intersection to travel west along City West Link.

Residents living in Balmain would access the project via the Rozelle interchange to travel to the New M5 or the proposed future Western Harbour Tunnel. A direct connection for the residents of the Balmain Peninsula to access the project locally would require additional property acquisition, upgrades to the local road network and impacts to amenity in the area while only providing limited additional connectivity.

The M4 East/Iron Cove Link to Anzac Bridge exit ramp would surface at the tunnel portal west of Victoria Road within the Rozelle Rail Yards, travel below the Victoria Road bridge and merge with the northern (eastbound) carriageway on the approach to Anzac Bridge (refer to cross section B in Figure 5-21 of the EIS). The Anzac Bridge to M4 East/Iron Cove Link entry ramp would diverge from the southern (westbound) carriageway of Victoria Road on the approach from Anzac Bridge, extend west adjacent to the westbound carriageway of Victoria Road and enter the tunnel portal south of the intersection of The Crescent and Victoria Road (refer to cross section A in Figure 5-12 of the EIS).

C5.4 Surface works at Rozelle

Two submitters raised issues regarding surface works at Rozelle. Refer to section 5.6 of the EIS for further information on Rozelle surface works.

C5.4.1 Queries regarding surface works at Rozelle

Submitters asked for clarification regarding surface works at Rozelle. Specific concerns included:

- Query regarding the extent of upgrades to Victoria Road's traffic lanes
- Query regarding the planned lane widths and speed on The Crescent.

Response

Upgrades to Victoria Road would be undertaken as part the Rozelle interchange surface works at Rozelle (refer to section 5.6.4 of the EIS). Upgrades to Victoria Road at Rozelle would include:

- Realigning and upgrading City West Link and The Crescent between around 300 metres east of Catherine Street at Lilyfield, and The Crescent/Victoria Road intersection
- Reconstructing the intersection of The Crescent and Victoria Road at Rozelle, including construction of a new bridge at Victoria Road and minor adjustments to Victoria Road north of this intersection
- Widening and adjustments of Victoria Road between The Crescent and Anzac Bridge
- Two new pedestrian and cyclist bridges over City West Link to connect Lilyfield Road and Victoria Road with Brenan Street at Lilyfield and The Crescent at Annandale, and a new pedestrian and cyclist underpass below Victoria Road to connect Lilyfield Road with Anzac Bridge.

Upgrades to Victoria Road as part the Iron Cove Link surface works (refer to section 5.7.4 of the EIS) would include:

- Four new lanes (two eastbound and two westbound) to connect Victoria Road to the Iron Cove Link including dive structure and tunnel portals
- Realignment and modifications to the Victoria Road eastbound and westbound carriageways between the eastern abutment of Iron Cove Bridge and around Springside Street at Rozelle. The Victoria Road surface lanes would travel on the northern and southern sides of the Iron Cove Link lanes
- Construction and installation of the Iron Cove Link ventilation facility on the southern side of the Victoria Road carriageway between Springside Street and Callan Street at Rozelle
- A ventilation outlet in the middle of the widened Victoria Road carriageway connected to the ventilation exhaust facility
- Modifications to the right turn from Victoria Road into Terry Street. This right-turn lane would extend across the cut-and-cover structures for the Iron Cove Link between the eastbound and westbound Victoria Road carriageways
- Closing Clubb Street at Victoria Road, creating a permanent cul-de-sac

- Tie-in works to connect the realigned westbound carriageway of Victoria Road with Toelle and Callan streets
- Landscaping on the southern side of Victoria Road between around Springside and Byrnes streets
- Realignment and improvements to the shared pedestrian and cyclist path that runs along the footpath on the southern side of the westbound carriageway of Victoria Road, including reinstatement of the Bay Run connection to Iron Cove Bridge
- A new stormwater bioretention facility adjacent to the eastern abutment of the Iron Cove Bridge, adjacent to Victoria Road and within King George Park (the bioretention facility has been relocated from the position proposed in the EIS, see **Chapter D3** (Relocation of the bioretention facility at Rozelle)) for further information), to treat stormwater runoff generated by the surface road works associated with the Iron Cove Link.

The Crescent at Annandale between City West Link and Johnston Street would be realigned west by around 75 metres. This section of The Crescent would comprise two northbound lanes, three southbound lanes and a median. Traffic lanes in both directions would be around 3.5 metres wide. The posted speed limit at this location would be 60 kilometres per hour (refer to Table 5-9 of the EIS).

C5.5 Ventilation systems and facilities

339 submitters raised issues regarding ventilation systems and facilities. Refer to section 5.8 of the EIS for further information on the design and operation of the ventilation facilities.

C5.5.1 Key components of the ventilation systems and facilities

Submitters requested clarification and further information (including figures) on the key components of the ventilation systems and facilities. Specific concerns included:

- Concern about lack of information regarding the design of ventilation outlet systems, including the level of redundancy, ventilation technology and dimensions
- Request details regarding the types of ventilation systems proposed for the project
- Concern about how the proposed mechanical ventilation system can work for large curved tunnels on multiple levels
- General opposition to new ventilation outlets, type of facilities and their placement in the city and near residential areas
- Concern that there will be four ventilation outlets in Rozelle
- Request for more details regarding the height, diameter, façade, depth and exact location of the four ventilation outlets proposed for Rozelle and Iron Cove
- Request for reduction in the height of the 20 metre tall ventilation facilities on Victoria Road adjacent to Terry Street
- Concern with the height of the three 38 metre tall ventilation facilities at the Rozelle Rail Yards being in a valley with an approximate elevation of 3.5 metres above sea level. Submitters noted that the valley is surrounded by schools and residents at elevations ranging from 28 meters to 37 metres above sea level, which come in line with the tops of the ventilation facilities
- Concern that the height of the three ventilation facilities at the Rozelle Rail Yards should be greater to more effectively disperse the emission plumes
- Concern with the discharge height from the ventilation facilities in the areas of Annandale, Rozelle and Leichhardt.

Response

Details of the ventilation systems

A description of the proposed ventilation system and facilities is provided in section 5.8.2 of the EIS. Cross-sections of the ventilation facilities are provided in:

- Figure 5-22 of the EIS for the ventilation facility at the Iron Cove Link
- Figure 5-35 of the EIS for the ventilation facility at the Rozelle Rail Yards
- Figure 5-51 of the EIS for the ventilation facility at the St Peters interchange.

Ventilation tunnels for the project at Rozelle and St Peters are shown in Figure 5-49 and Figure 5-50 of the EIS respectively.

A number of options for the design of the ventilation system were considered during the preparation of the concept design for the project and are described in section 4.6.1 of the EIS. Options included alternative ventilation system designs, ventilation outlets and ventilation facility locations Ventilation outlet parameters are described in detail in Annexure I of Appendix I (Technical working paper: Air quality) of the EIS.

The project's ventilation system has been designed to ensure that air inside and outside the tunnels meets the air quality criteria relevant to the project as described in Chapter 9 (Air quality). This is achieved by providing fresh air to and removing exhaust air from the tunnel. Elevated ventilation outlets are used for longer tunnels in urban areas in Australia to disperse tunnel air at a height that maximises dispersion of emissions to minimise ventilation outlets to ground level concentrations of key pollutants.

The movement of air in the ventilation system is similar to the movement of air in a ducted heating or cooling system in a building. Air from the tunnels is drawn into ventilation exhaust ducts which are often at ninety degrees to the direction of flow. Each tunnel has its own jet fans to control the direction of flow, irrespective of the level of the tunnels.

The main considerations in relation to the design and location of ventilation facilities include minimising local air quality impacts on nearby receptors, maximising the operational efficiency of the tunnel ventilation system and meeting aviation safety requirements. For the ventilation outlets proposed for the M4-M5 Link, including the outlets at Rozelle and Iron Cove, the height, diameter and number of the outlets was primarily determined by the volume of air to be expelled (which is calculated based on tunnel width and length) and project air quality objectives. The locations and heights (above ground level) of the ventilation outlets included in the air quality assessment are provided in Table 9-10 and Figure 9-7 in section 9.4.2 the EIS and are reproduced in **Table C5-1**.

Table C5-1 Height and location of ventilation outlets

Location	Ventilation outlet	Outlet Location X	(MGA94) Y	Ground elevation (m)[1]	Outlet height above existing ground elevation (m)
Parramatta Road	PAR-2	327108	6249875	12.1	25.0
Rozelle (west)	ROZ-1	330906	6250633	4.2	35.0
Rozelle (east)	ROZ-2	330972	6250679	5.0	35.0
Rozelle (mid)	ROZ-3	330939	6250656	4.5	35.0
St Peters interchange	SPI-5	331765	6245940	9.0	22.0
	SPI-6	331775	6245933	8.9	22.0
	SPI-7	331775	6245925	8.9	22.0
	SPI-8	331765	6245918	9.0	22.0
Rozelle near Iron Cove	ICL-1	330391	6251650	23.2	20.0

Notes:
1 Taken from GRAMM (Graz Mesoscale Model) terrain file

The ventilation system has been designed to manage fire and other incidents in the tunnels, and in particular to control the spread of smoke. The tunnel system has multiple exits and a traffic control system that can direct traffic to the nearest exits and prevent more traffic entering the tunnels in case of emergencies (refer to section 5.3.2 and section 6.5.8 in Annexure L of Appendix I (Technical working paper: Air quality) of the EIS).

Redundancy has been built into the electricity supply system for the project. If electricity supply is not available despite the inbuilt dual redundancy, a system of uninterrupted power supply batteries would provide back-up power for operation of essential equipment, including fire and life safety systems.

A detailed review and finalisation of all permanent infrastructure, including ventilation facilities, would be carried out during detailed design. The final built form and architectural treatment of structures would be subject to UDLPs for the project and would be guided by performance requirements, the outcomes of community consultation and the urban design principles for the project (see section 13.2.2 of the EIS). Following this, further detailed visual representations would be provided to the community via community updates.

UDLPs would be prepared in consultation with relevant councils, stakeholders and the community prior to the commencement of permanent built surface works and/or landscape works. This plan would follow the urban design principles that have been developed for the project and would be consistent with the key urban design guidelines and policies including *Beyond the Pavement: Urban Design Procedures and Design Principles* (Roads and Maritime 2014a). The potential visual impact and urban design of the ventilation systems and facilities are discussed in Chapter 13 (Urban design and visual amenity) of the EIS.

Location of ventilation facilities

As described above, a longitudinal ventilation system is proposed for the project, which requires a ventilation outlet at each end of the mainline tunnels and for the Rozelle interchange and the Iron Cove Link.

The location of sensitive receivers and local topographical conditions are considerations in the siting and height of ventilation outlets, as outlined in further detail in section 4.6.1 of the EIS. However, the highly urbanised environment severely constrains finding a location that can fully avoid all sensitive receivers while also meeting design, safety and operational requirements. The ventilation outlets and systems are, however, designed so that contributions to ground level concentrations of pollutants in the vicinity are minimal (see section 9.7 of the EIS).

The Rozelle ventilation facility (including the three ventilation outlets) would be located within the Rozelle interchange at the Rozelle Rail Yards. Locating the ventilation facility within the Rozelle Rail Yards provides a ventilation facility location that would be suitable to service the constituent tunnel portals of the Rozelle interchange including portals for the M4 East and New M5 tunnels as well as connections to the proposed future Western Harbour Tunnel.

The ventilation outlet at the Iron Cove Link ventilation facility would be located in the centre of Victoria Road to increase the distance of the ventilation outlet from residences.

The Campbell Road ventilation facility at St Peters would be located at the northern end of the project footprint of the New M5 project at the St Peters interchange. Locating the Campbell Road ventilation facility within the New M5 footprint minimises land acquisition requirements and streamlines the design and construction process for the M4-M5 Link.

A ventilation facility at Haberfield being built as part of the M4 East project would also be used for the M4-M5 Link project. This facility would consist of both a ventilation exhaust facility and a ventilation supply facility. Fitout works would be carried out within part of this structure as part of the project (refer to Chapter 6 (Construction work) of the EIS for a description of these fitout works).

Height of ventilation outlets

The locations and heights (above ground level) of the ventilation outlets included in the air quality assessment are provided in Table 9-10 and Figure 9-7 in section 9.4.2 the EIS and are reproduced in **Table C5-1**.

The height of the outlets was optimised by testing the effect of different outlet heights on the ground level concentrations of pollutants. The height of 35 metres above existing ground level for the outlets at the Rozelle Rail Yards was an effective height which minimised the ventilation outlet contributions to the ground level concentrations while meeting the aviation safety requirements. This was confirmed in later sensitivity testing which is reported in **section B2.1.3**.

While some of the suburbs surrounding the Rozelle Rail Yards are at a naturally higher elevation, this has been factored into the ambient air quality dispersion modelling from the outlets. Sensitivity testing was undertaken for these outlets to determine the impact of the outlet on local air quality. The resulting outcome was that outlet heights of around 35 metres above ground level at Rozelle are appropriate (see **Table C5-1**). Given that the air is exhausted at speed and the plume rises due to its velocity and because it is generally warmer than the outside air, the effective height for dispersion is higher than the height of the outlets.

C5.6 Motorway operational ancillary infrastructure

78 submitters raised issues related to the proposed motorway operational ancillary infrastructure. Refer to section 5.8 of the EIS for further information on the motorway operational ancillary infrastructure.

C5.6.1 Darley Road motorway operations complex (MOC1)

Submitters asked for clarification and further information on the following components of the Darley Road motorway operations complex relating to periods during construction, operation and future maintenance (including the substation and water treatment plant):

- Number of workers on site
- Hours of operation.

Response

For the M4-M5 Link project, a design and construction contractor(s) would be appointed to undertake the detailed design and construction planning following determination of the EIS, should it be approved. This process would include refining the details of the ancillary infrastructure, which would include operational details such as required staff numbers and hours of operation. The motorway operations complex would operate continuously, however staff would not be required at the site full time. Staff would be required to be present at the site primarily for intermittent maintenance activities.

As outlined in **section A2.5**, consultation with the community and other key stakeholders will continue during the ongoing refinement of the design and during construction, with a view to further minimising impacts of the project on communities.

C5.6.2 General motorway operational ancillary infrastructure

Submitters were concerned over the installation of large, electronic traffic signs in conjunction with M4 East on local roads in Haberfield. A number of submitters supported the two separate motorway operational complexes within the Rozelle Rail Yards.

Response

Traffic, locational, directional, warning and variable message signs would be incorporated within the tunnels and on surface roads at approaches to the tunnels. The signs are required to provide information to motorists regarding traffic safety including the notification of incidents and congestion within the tunnel.

Directional signage would be installed in accordance with the Austroads and Roads and Maritime standards, with a focus on providing clear and unambiguous direction to motorists and minimising potential lighting impacts to nearby receivers. All signage within the tunnels would be backlit and located to provide clear, highly visible, progressive and instructive decision-making information for motorists.

Variable message signs would be mounted on gantries along roads which approach the tunnels and would be used to advise motorists of traffic conditions. The variable message signs within the tunnels would comprise single-line-text advisory signs above traffic lanes.

Integrated speed and lane-use signs would be installed along the length of the project. These signs would generally display the regulatory speed limit along the project, and would be modified at the motorway control centre to display variable speed limits in response to incidents and congestion. The signs would be located around 200 metres before the tunnel portals, around 50 metres before each exit ramp and around 50 metres after each entry ramp. The location and type of all road signage would be confirmed during detailed design.

The support for separate motorway operation complexes within the Rozelle Rail Yards is noted.

C5.7 Operational management

150 submitters raised issues regarding operational management of the project. Refer to section 5.8 of the EIS for further information on operational management of the project.

C5.7.1 Fire and life safety

Submitters raised concerns about access to emergency access points within tunnels in the event of a traffic incident, congestion or a fire break out and were concerned that there was no consideration of emergency access points in the EIS. Specific concerns included:

- Safety of vehicles and emergency access within the Rozelle interchange and Haberfield tunnels
- Request for more detail regarding the disabled access in the emergency cross tunnel passages
- Concern that the EIS does not adequately explain the safety procedures in place when situations such as serious congestion, fire or accidents should occur
- Concern about lack of information regarding the operational management in the design of ventilation systems in case of emergencies
- Concern that should serious congestion occur deep in the tunnels, air quality would become toxic unless appropriately managed
- Safety measures in place if failure of the ventilation facilities occurs
- What coordination will there be between all WestConnex projects in the event of a disaster that may impact multiple sections of the tunnels.

Response

As described in section 5.8.3 of the EIS, fire safety in Australian road tunnels follows a defined fire safety engineering process outlined in Australian Standard AS4825 - Tunnel fire safety, which also provides a 'Trial Concept Design' when developing road tunnel fire safety systems. Once the M4-M5 Link is constructed, a single entity would undertake operations for the widened M4 Motorway, M4 East, New M5, M5 East, and M4-M5 Link from a combined motorway control centre at the St Peters interchange. The operating entity will use an integrated operations management control system to manage the entire WestConnex network. Fire and life safety would be managed in accordance with a consistent fire and life safety protocol across the entire WestConnex motorway. The objectives outlined in section 5.8.3 of the EIS would form the basis of the fire safety design for the M4-M5 Link tunnels.

Vehicular cross passages and breakdown bays would be provided within the tunnels as described in **section C5.2.3**. Connections between the tunnels would cater for egress for people with disabilities by minimising stairs or ramps with steep grades and providing alternative safe holding zones.

The project would also include longitudinal egress passages along the entry and exit ramps, to allow pedestrians to exit the tunnel and ramps in the event of a major incident.

Additional key components of the project's fire and life safety measures are listed below and are described in full in section 5.8.3 of the EIS:

- Twin tunnels: The tunnels would be separated by fire-rated materials to provide for one-way, fire-separated carriageways. This arrangement would allow motorists to move to a safe place underground into a non-incident fire-separated carriageway
- Emergency egress and access for emergency response teams: Fire and Rescue NSW would use the cross passages between the tunnels to access an incident from a non-incident zone
- Smoke control system: Longitudinal smoke control is proposed as the primary means of smoke management for the M4-M5 Link project. This would involve blowing smoke along the tunnel in the direction of vehicle travel to ensure that vehicles stopped upstream of (or before) an incident are safe and vehicles downstream of (or after) an incident keep driving out of the tunnel or into the next ventilation section

- Water suppression system: Water suppression (deluge) would be used to manage fire and ensure occupant safety, operational continuity and asset protection. A deluge suppression system would minimise the fire size, reduce fire spread and heat generation and assist the fire brigade in managing a fire event.

The tunnel ventilation and fire and life safety systems have been designed to cater for normal, congested and emergency traffic conditions (refer to section 5.8.2 and section 5.8.3 of the EIS).

During a major incident when traffic is stopped in the tunnel, the jet fans would be used to increase the air flow to protect vehicle occupants and emergency services personnel from a build-up of emissions. Drivers would be requested, via the public address system, to turn off vehicle engines if there is an extended delay, while the incident is cleared. This would assist in reducing emissions inside the tunnel.

Redundancy has been built into the electricity supply system for the project. If electricity supply is not available despite the inbuilt dual redundancy, a system of uninterrupted power supply batteries would provide back-up power for operation of essential equipment, including fire and life safety systems, for at least one hour.

In the case of a fire, the carriageway on which the incident occurred would be closed to incoming traffic and traffic downstream of the fire (ie between the fire and a tunnel portal) would exit the tunnel. Jet fans would be used to propel the smoke downstream to the nearest ventilation outlet, or tunnel portal(s), depending on the location of the fire. This would prevent smoke flowing backwards from the fire source over any vehicles that are stationary behind the fire.

Access by emergency services during an incident are discussed in **section C5.2.3**.

See **section C9.10** for issues raised regarding air quality impacts within tunnels.

C5.8 Drainage and water treatment facilities

16 submitters raised issues regarding drainage and water treatment facilities. Refer to section 5.9 of the EIS for further information on drainage and water treatment facilities.

C5.8.1 Drainage and water treatment

Submitters raised concerns and requested more information regarding the new facilities and changes to the existing surface water and drainage facilities with regards to the project. The main issues include:

- It is not clear how Whites Creek would be widened where it is constrained by the brick heritage tunnel for the creek created by the light rail overbridge
- Questions regarding whether the bioretention facility at King George Park would be a permanent fixture, what its purpose is and whether it has associated health and safety risks.

Response

Flood mitigation works would be performed along Whites Creek between the light rail bridge and Rozelle Bay. Downstream of the new The Crescent bridge, the flood mitigation works would include widening and improvement works to the channel and naturalisation of the creek banks. The final flood mitigation works would be subject to detailed design. The Arched Bridge over Whites Creek (a component of the light rail line), which is heritage listed under the Sydney Regional Environmental Plan No. 26 - City West, would not be impacted as identified in Chapter 20 (Non-Aboriginal heritage) of the EIS, as widening and improvements works would be undertaken downstream of the bridge.

Chapter 5 (Project description) of the EIS describes the location of permanent operational infrastructure for the project, including a bioretention facility for stormwater runoff at the informal car park at King George Park at Rozelle (adjacent to Manning Street). However, the proposed location of the bioretention facility on Manning Street at Rozelle as outlined in Chapter 5 (Project description) of the EIS is on land currently subject to an undetermined Aboriginal Land Claim lodged by the Metropolitan Local Aboriginal Land Council (over Lot 662 in Deposited Plan 729277). Given the uncertainty regarding the future outcome and timing of the resolution of this claim, an alternative location for the bioretention facility was investigated.

It is proposed to relocate the bioretention facility around 150 metres north of the location presented in the EIS, to an area adjacent to Victoria Road at the eastern abutment of the Iron Cove Bridge and within King George Park. Part of the land that would be occupied by the bioretention facility at this location is located partially outside the project footprint assessed in the EIS. A description of the revised location of the bioretention facility is provided in **Chapter D3** (Relocation of the bioretention facility at Rozelle).

The bioretention facility would comprise a vegetated area where runoff would pass through soil, sand and gravel filtration layers to be collected by a drain. The facility would be a permanent component of stormwater infrastructure for the project and treat runoff from the Iron Cove Link via natural filtration processes before discharging into Iron Cove. Subject to detailed design, the bioretention facility would connect to an existing drop pit which outlets to Iron Cove. The design of the bioretention facility would consider public safety and amenity.

Wastes associated with the bioretention facility would be limited to sediment removal and organic waste from weeding and litter removal during maintenance activities. There is not expected to be any biohazards associated with this facility; the filtration process mimics a natural filtration process by using vegetation planted in soil to filter impurities from surface water runoff. This would improve water quality entering Iron Cove from this facility.

C5.9 Utilities services

One submitter raised issues regarding impacts to utility services. Refer to section 5.10 of the EIS for further information on utility services

C5.9.1 Request for information regarding utility services

A submitter expressed concern that the EIS lacked sufficient detail regarding utility services for the project, particularly regarding the power capacity requirements for Haberfield during free flowing traffic conditions. The submitter was concerned that the power source for the mainline tunnel and Wattle Street interchange is not adequately documented.

Response

Electricity supply infrastructure required for the project is outlined in section 5.10.1 of the EIS. Electricity supply infrastructure would be installed to supply power to the tunnels and associated mechanical and electrical equipment needed during operation.

The maximum power demand for the tunnels is driven predominantly by the ventilation system, particularly for scenarios involving congested traffic conditions or a fire within the tunnels. During normal free-flowing traffic conditions, the power demand for ventilation is significantly reduced by comparison. Therefore much of the network capacity remains unused for most of the time.

A bulk power supply would be provided in a single location or two locations and then distributed to the ventilation outlets and jet fans within the tunnels. The Ausgrid transmission voltage is 33 kilovolt and this is the nominated preference for the bulk power supply.

There are two substations optimally located to provide the bulk power supply connection for the project:

- Alexandria zone substation, at Bourke Road, Alexandria. This substation is currently under construction and is expected to be completed in late 2017
- Rozelle zone substation, at Manning Street, Rozelle.

An upgrade of the Rozelle zone substation would be required to accommodate the bulk power supply connection for the M4-M5 Link project. It is anticipated that these works would be carried out by Ausgrid.

Intake substations (substations that would connect to the Ausgrid network and would manage the intake and distribution of the project's power needs) would be required. These would be constructed above ground at the following locations:

- Rozelle West motorway operations complex (MOC2) at Rozelle
- Iron Cove Link motorway operations complex (MOC4) at Rozelle

- Campbell Road motorway operations complex (MOC5) at St Peters

The indicative locations of intake substations are shown in Figure 5-45 and Figure 5-48 of the EIS.

From the intake substations, electricity would be distributed to the project via the tunnels, to connect to substations at the Rozelle East motorway operations complex (MOC3) and the Iron Cove Link motorway operations complex (MOC4). In addition, the need for a substation at the Darley Road motorway operations complex (MOC1) is being investigated and would be confirmed during detailed design. The project would also include a series of underground substations at a spacing not exceeding around 1.2 kilometres within the tunnel. An indicative layout of an underground substation is shown in Figure 5-53 of the EIS.

Further information about electricity connections for the project is provided in Appendix F (Utilities Management Strategy) of the EIS.

Power requirements for the Wattle Street interchange at Haberfield are subject to the M4 East project.

C5.10 Local road upgrades

14 submitters raised issues regarding local road upgrades. Refer to sections 5.6 and 5.7 of the EIS for further information on proposed changes to local roads.

C5.10.1 Local roads at Rozelle

A submitter requested clarification and further information (including figures) on information regarding local road upgrades at Rozelle, including:

- The width of Victoria Road (with the tunnels incorporated underneath). Request a more detailed visual representation of the road
- Locations, structure and use of safety crossings over Victoria Road.

A submitter was concerned that future widening of Denison Street at Rozelle would be required for the open space at the Rozelle Rail Yards.

Response

Sections 5.6.1 and 5.7.3 of the EIS describes the proposed changes to local roads and intersections which would result from the project.

For the M4-M5 Link project, a design and construction contractor(s) would be appointed to undertake the detailed design and construction planning following determination of the EIS, should the project be approved. This process would include refining the details of alterations to local roads and crossings. The design presented by the contractor would need to be consistent with any environmental management measures and conditions of approval for the project.

The width of Victoria Road as presented in the concept design for the project would be variable and would increase towards the Iron Cove Link tunnel portals where, at its widest it would be around 45 metres. At the widest point Victoria Road would consist of 10 lanes of traffic (see Figure 5-40 of the EIS) including:

- The Iron Cove Link entry ramp (two traffic lanes)
- The Iron Cove Link exit ramp (two traffic lanes)
- Victoria Road eastbound carriageway (two lanes for general traffic and one bus lane)
- Victoria Road westbound carriageway (three traffic lanes).

As outlined above, the width of Victoria Road would be subject to detailed design.

For the operation of the project, connectivity across Victoria Road within the project footprint would exist via:

- A signalised pedestrian crossing connecting Toelle and Terry streets
- A new pedestrian and cyclist underpass below Victoria Road to connect Lilyfield Road with Anzac Bridge.

The design of the crossing and underpass would be refined during detailed design. The existing connectivity over Victoria Road outside of the project footprint would remain unchanged.

Widening of Denison Street at Rozelle is not proposed for the project.

As outlined in **section A2.5**, consultation with the community and other key stakeholders will continue during the ongoing refinement of the design and during construction, with a view to further minimising impacts of the project on communities.

C5.10.2 Local roads (general)

Submitters requested clarification and further information (including figures) on information regarding local road upgrades, including:

- Operational traffic mitigation measures involving upgrades to local roads are mentioned but not detailed in the EIS
- The EIS notes that the project would cause additional traffic congestion on a number of key roads including Gardeners Road and Bourke Road in the south, Frederick Street (Ashfield), Johnston Street (Annandale) and numerous streets in Mascot (p.8-103). The EIS must assess and identify any upgrades that the project would require.

Response

Appendix H (Technical working paper: Traffic and transport) of the EIS acknowledges that management of operational traffic and transport impacts around the three interchanges at Wattle Street, Rozelle and St Peters would be required. As with the M4 East and New M5 projects, Roads and Maritime would undertake a Road Network Performance Review, in consultation with Transport for NSW and relevant councils. This would confirm the operational traffic impacts of the M4-M5 Link on surrounding arterial roads and major intersections at both 12 months and five years after opening of the project. The assessment would be based on future updated traffic surveys taken during operation utilising an appropriate methodology following the relevant and industry accepted guidelines current at the time. Regardless, those areas that have been identified as being potentially impacted by the project have been identified in Appendix H (Technical working paper: Traffic and transport) of the EIS and would be addressed prior to these operational reviews, or as needed.

See **section B10.8.8** for further information regarding potential future road upgrades and network integration works.

C5.11 Active transport

301 submitters raised issues relating to active transport. Refer to section 5.5 and Appendix N (Technical working paper: Active transport strategy) of the EIS for further information on active transport.

C5.11.1 Active transport route access

Submitters raised concerns regarding the improvement of cyclist and pedestrian connectivity and accessibility. It was requested that footbridges be accessible and plentiful. Specific queries and concerns included:

- There is a lack of provision for cycling infrastructure
- Request for detailed designs regarding the proposed cycle networks
- Concern with lack of detail and consistency around the proposed active transport infrastructure and no commitment has been given to achieve the proposed active transport links
- Concern with the proposed gradient of the shared paths
- Concern that there is no provision for cycle access through the tunnels
- How pedestrian connectivity would be improved along Victoria Road between Darling Street and Terry Street, and whether there would be a footbridge or underpass at this location
- Whether a signalised crossing would remain at Terry Street over Victoria Road to provide access for pedestrians and specifically to bus stops on either side of the road

- Whether the proposed land bridge over The Crescent at City West Link would be a shared path
- Objections to the loss of the 'Beatrice Bush Bridge' and Lilyfield Road footbridge over Victoria Road and querying whether the existing bridge will be replaced
- Request for more details regarding the preservation of cycle paths on Victoria Road after construction
- Concern about losing the walking and bicycle routes in Buruwan Park and the access to Bicentennial Park due to widening of the road at the end of Johnston Street
- Request for more details regarding the 'worker's bridge' to be built across Parramatta Road
- Query if the pedestrian and cycle bridge over City West Link will be replaced post construction
- The proposed alternative cycling routes are based on distance and take no account of time taken or topography
- Details requested regarding access to King George Park and the Bay Run by cyclists and pedestrians during operation
- Whether cyclists will be able to cross the Inner West Light Rail line near the Rozelle Bay light rail stop via the new bridge over City West Link.

Response

An active transport strategy has been developed for the project and is provided in full at Appendix N (Technical working paper: Active transport strategy) of the EIS. The active transport strategy was developed in consultation with stakeholders and through analysis of current and proposed active transport routes and relevant active transport policies and guidelines.

The project would deliver the active transport links identified in **Table C5-2** in accordance with the concept design for the project. Several factors were considered in selecting the proposed routes including local context, existing infrastructure and parks, topography and community feedback. The final design of the active transport links to be delivered by the project would be subject to detailed design and documented in UDLPs that will be prepared for the project. UDLPs will be prepared in consultation with stakeholders and the community and would be exhibited for public comment prior to the commencement of permanent built surface works and/or landscape works.

An Active Transport Network Implementation Strategy will be prepared for the project. The strategy will be consistent with the active transport strategy in Appendix N (Technical working paper: Active transport strategy) of the EIS. The strategy will be prepared in consultation with relevant councils and Bicycle NSW and implemented prior to the commencement of project operations or as otherwise agreed to by the Secretary of DP&E (see **Chapter E1** (Environmental management measures)).

The project would improve connectivity and safety for pedestrians and cyclists. Cyclist and pedestrian paths delivered by the project would create safe links that have reasonable grades and are separated from vehicular traffic. The final gradients of cyclist and pedestrian paths would be subject to detailed design. Two key pedestrian bridges would be replaced at Victoria Road and City West Link, maintaining existing active transport access at Rozelle (refer to section 6.6.2 of the EIS for further information regarding the removal of these pedestrian bridges)

Generally non-motorised transport modes are not permitted on motorways due to the higher speed limits used for traffic, except where there are wide shoulders that provide appropriate separation for cyclists from traffic. Cyclists and pedestrians are not permitted in tunnels because of the lack of separation from fast moving traffic and the longer transit times in the tunnel.

The project provides an opportunity to address poor and limited active transport connectivity in the study area, including along Victoria Road and through and around the Rozelle Rail Yards at Rozelle. In addition, diverting through traffic from local roads onto roads upgraded as part of the project around the interchanges and into the WestConnex tunnels would improve pedestrian and cyclist safety.

Indicative active transport links being delivered as part of the project are listed in **Table C5-2**.

The project does not propose to construct a bridge over Parramatta Road.

Table C5-2 Indicative active transport links being delivered as part of the project

Route	Feature	Length	Benefits
Rozelle Rail Yards Link Links the Bay Run, The Bays Precinct and the Greenway in the west to the Anzac Bridge and Sydney CBD in the east	Underpass	150 m	• Provides the junction connecting the Rozelle Rail Yards and Victoria Road to The Bays Precinct • Provides north-south connectivity between Glebe and Annandale with Rozelle and Balmain • Provides a connection from the inner west to The Bays Precinct via the Rozelle Rail Yards • Removes the need for an at-grade crossing at City West Link • Connects to the Rozelle Bay light rail stop
	Shared path	1 km	• Provides the link between Victoria Road and Lilyfield Road across the Rozelle Rail Yards
Victoria Road – Iron Cove Link Links the northern suburbs of Drummoyne, Russell Lea and Chiswick to The Bays Precinct and the Sydney CBD	Separated cycle-way	250 m	• Provides a separated cycleway and footpath on the western side of Victoria Road along the extent of the M4-M5 Link work • Connects the eastern side of the Rozelle Rail Yards along Victoria Road to the intersection of Robert Street • Connects the existing retail centres on Darling Street and Victoria Road, as well as social infrastructure and active and passive recreation facilities
	Separated cycle way	450 m	• Links the intersection of Springside Street to the Iron Cove Bridge and the Bay Run
	Bridge	200 m	• Connects Victoria Road to The Crescent over the Rozelle Rail Yards • Connects to Rozelle Bay light rail stop • Removes the conflict between pedestrians and cyclists with traffic on City West Link • Removes the need for an at-grade crossing at City West Link and increases pedestrian safety • Provides north-south connectivity between Glebe and Annandale with Rozelle and Balmain
	Shared path	400 m	• Connects Victoria Road to the Crescent
	Shared path	500 m	• Connects The Crescent to the James Craig Road existing active transport network
Whites Creek Link Parramatta Road to the Rozelle Rail Yards and Callan Park	Bridge	200 m	• Links the intersection of Brenan Street and Railway Parade with City West Link and the Rozelle Rail Yards • Links residential communities in Annandale and Lilyfield • Addresses connectivity from Whites Creek to the Rozelle Rail Yards, crossing the Light Rail line and City West Link
Johnstons Creek Valley Link Extends the existing Johnstons Creek pathway to connect Glebe Foreshore to Parramatta Road	Bridge and shared path	300 m	• Connects Easton Park to The Crescent through the Rozelle Rail Yards • Addresses connectivity from Johnstons Creek to the Rozelle Rail Yards • Links Glebe Foreshore and parklands to the Rozelle Rail Yards and Parramatta Road and The Bays Precinct

Route	Feature	Length	Benefits
	Shared path	500 m	• Provides a suitable cycling space for the connection along The Crescent into Jubilee Park and linking to the existing Glebe Foreshore • Provides connectivity and links to an existing and proposed off-road active transport network

Connectivity around Victoria Road near Terry Street and King George Park

The Iron Cove Link portals would be located west of the Toelle Street–Terry Street connection, enabling upgrades to the existing signalised pedestrian crossing to provide a strong north-south connection. An overpass is not proposed at this location for the project.

Access to King George Park and the Bay Run by cyclists and pedestrians would remain unchanged during operation of the project. While Clubb Street would become a permanent cul-de-sac, cyclist and pedestrian access from Victoria Road to King George Park via Clubb Street would be retained. Refer to section 6.6 of the EIS for impacts to access during the construction of the project. See **Chapter D3** (Relocation of the bioretention facility at Rozelle) for further information regarding the reinstatement of the Bay Run following construction.

Connectivity around Victoria Road and City West Link

The existing pedestrian bridge over Victoria Road east of the intersection with City West Link (identified as 'Beatrice Bush Bridge' by submitters) would be removed for widening and adjustments of Victoria Road between The Crescent and Anzac Bridge as part of the Rozelle surface works. The existing bridge provides pedestrian and cyclist connectivity to Lilyfield Road and Anzac Bridge over Victoria Road from the shared path located to the south of City West Link towards The Crescent. Alternative routes for when the bridge is removed during construction are described in Chapter 8 (Traffic and transport) of the EIS and would be established before closure of the bridge.

The project would establish pedestrian and cyclist connectivity over City West Link via two new pedestrian and cyclist bridges over City West Link to connect Lilyfield Road and Victoria Road with Brenan Street at Lilyfield and The Crescent at Annandale. The project would also include a new pedestrian and cyclist underpass below Victoria Road to connect Lilyfield Road with Anzac Bridge.

The proposed land bridge connecting The Crescent with the Rozelle Rail Yards would be a shared path.

Temporary closures for active transport links around Victoria Road during construction are identified in Table 6-20 of the EIS and include:

- Temporary closure of the shared path on the southern side of Victoria Road at Rozelle during construction. A temporary diversion would be provided along Springside Street, McCleer Street, Callan Street, Manning Street and Byrnes Street at Rozelle
- Temporary diversion of the Bay Run connection to the shared path along Iron Cove Bridge during construction. Alternative access to Iron Cove Bridge would be provided.

These active transport links identified above would be reinstated at the completion of construction.

Connectivity around The Crescent

There is an existing active transport connection at Buruwan Park which links Railway Parade to The Crescent under the Inner West Light Rail line bridge (see **Figure C13-1**). This connection would be temporarily removed during construction. Refer to Table 6-20 of the EIS and **Figure C13-2** for proposed modification to active transport connections during construction.

For the operation of the project, the connection under the Inner West Light Rail line bridge would be reinstated. This would connect Railway Parade to the realigned The Crescent and to the proposed pedestrian and cyclist bridge linking The Crescent and the Rozelle Bay Light Rail stop with the Rozelle Rail Yards over City West Link (see **Figure 13-3**).

Cyclists travelling from the Rozelle Rail Yards would use the pedestrian and cyclist bridge to cross City West Link and The Crescent and cross the Inner West Light Rail line at the Rozelle Bay Light Rail stop. Cyclists would also have the option to cross the rail line further to the east via the new bridge over City West Link linking Lilyfield Road and Brenan Street which would be constructed at the western end of the Rozelle Rail Yards.

Connection to the Glebe Foreshore that currently exists from the active transport routes at Buruwan Park would be provided through the new land bridge between the Rozelle Rail Yards and The Crescent and the shared path along The Crescent, as well as at the existing at-grade pedestrian crossing at the corner of Johnston Street. The shared path would provide a suitable cycling space for the connection along The Crescent into Jubilee Park and linking to the existing Glebe Foreshore.

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C6 Construction work

This chapter addresses issues raised in community submissions associated with the construction required for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 6 (Construction work) of the EIS for the further details on the construction of the project.

Where changes have been made to certain aspects of the project construction since exhibition of the EIS, these have been summarised in **Part D** (Preferred infrastructure report).

Contents

C6.1 Construction strategy - program and staging

1522 submitters have raised issues regarding the construction strategy in the M4-M5 Link EIS. Refer to section 6.1 and section 6.2 of the EIS for details of the construction program and staging.

C6.1.1 Timing and duration of the construction program

Submitters raised questions and concerns about the timing and duration of the construction program. Specific concerns included:

- The community will be negatively impacted by construction activity for an extended period of time
- Objection to the extended construction period at Haberfield and St Peters
- The EIS has failed to adequately address impacts from the overlap of construction at the proposed civil and tunnel sites at Haberfield and Ashfield
- The EIS refers to construction impacts associated with the project as being temporary. Submitters do not consider a five year construction period as temporary
- Construction hours may be extended at the Rozelle Rail Yards site and The Crescent civil site when the construction schedule falls behind
- The lack of detail for the duration of time that the M4 East entry/exit ramps would be used in Option B
- Overlap between construction of the M4 East and M4-M5 Link is not made clear
- Whether the design and construction contractor or NSW Roads and Maritime Services (Roads and Maritime) will have control and responsibility for the timing of the staging works with the surface road network at the Wattle Street interchange
- Site establishment works are not identified in the construction timeline.

Response

Details about the proposed approach to construct the project are provided in Chapter 6 (Construction work) of the EIS. **Part D** (Preferred infrastructure report) describes changes to two areas of the proposed construction approach that have occurred in response to issues raised in submissions. In addition, design refinements for the spoil haulage routes for the Darley Road civil and tunnel site (C4) are described in **section C4.18.1** and refinements to the construction ancillary facilities at Haberfield and Ashfield are described below.

The total duration of construction of the project would be around five years. As described in section 6.1.2 of the EIS, construction would be carried out in two stages. Construction of the mainline tunnels (Stage 1) would occur between 2018 and 2022 and construction of the Rozelle interchange and the Iron Cove Link (Stage 2) would occur between late 2018 and 2023. Stage 1 of the project is expected to be complete and open to traffic by 2022 and the whole project would be complete and open to traffic by 2023.

The indicative construction program is shown in Table 6-2 of the EIS. The successful design and construction contractor(s) will develop the detailed design and a detailed construction methodology for the project, including the timing of staging works.

Given the length and largely linear nature of the project, the presence and intensity of construction activities at any given point would vary over the construction period. However, activities at certain construction ancillary facilities would be reasonably constant throughout construction. This is particularly applicable for the tunnelling sites at the Wattle Street civil and tunnel site (C1a), Parramatta Road West civil and tunnel site (C1b), Darley Road civil and tunnel site (C4), Rozelle civil and tunnel site (C5), Pyrmont Bridge Road tunnel site (C9) and Campbell Road civil and tunnel site (C10), as well as at the Iron Cove Link civil site (C8).

Civil construction works would generally occur between 7.00 am and 6.00 pm Monday to Fridays and 8.00 am to 1.00 pm on Saturdays. Some civil works outside of these standard construction hours may also be required, which could include:

- Work determined to comply with the relevant noise management level at the nearest sensitive receiver
- The delivery of materials outside approved hours as required by the NSW Police or other authorities (including Roads and Maritime) for safety reasons
- Emergency situations where it is required to avoid the loss of lives and property and/or to prevent environmental harm
- Situations where agreement is reached with affected receivers.

Further information about works that would be carried out outside of standard construction hours is provided in **section C6.12.1** and further justification for these works is provided in **section B2.3.1**.

Environmental management measures that would be implemented to manage the impacts identified in the EIS and the preferred infrastructure report (see **Part D** (Preferred infrastructure report)) are outlined in **Chapter E1** (Environmental management measures).

Duration of construction program at Haberfield/Ashfield and St Peters

Concerns regarding the longer duration impacts at Haberfield and Ashfield are addressed in **section B2.2.1**.

Based on community feedback and concerns raised in submissions on the EIS, a number of refinements to the construction ancillary facilities at Haberfield and Ashfield have been made to further minimise impacts on the community and sensitive receivers. This includes:

- Wattle Street civil and tunnel site – the area at the surface is currently being used as a construction zone for the M4 East project and would no longer be used. Construction activities would be limited to the Wattle Street entry and exit ramps
- Haberfield civil site – footprint reduced and the site would be used as a civil site only as per the arrangement for the Haberfield civil site (C2b). The C2a option would therefore not be used for the construction of the project. No tunnelling from this site is proposed.

These refinements would allow landscaping and urban design works associated with the M4 East Urban Design Landscape Plan (UDLP) and Residual Land Management Plan in the area around Wattle Street and Walker Avenue at Haberfield to be carried out at the completion of M4 East construction.

To minimise the impacts associated with longer duration construction impacts from the concurrent construction of the WestConnex component projects in these areas and to respond to issues raised during the construction of other WestConnex projects and in submissions on the M4-M5 Link EIS, the following strategies are proposed:

- Provision of additional off-street car parking for the construction workforce at Rozelle, with the use of the White Bay civil site which would provide around 50 parking spaces. This site is further described in **Chapter D2** (White Bay civil site (C11))
- Using the Northcote Street civil site (C3a) for construction workforce car parking and laydown. Currently this site is used as the main tunnelling site for the eastern end of the M4 East project
- Reducing the surface construction footprint of the Wattle Street civil and tunnel site (C1a) to limit surface construction activities to the Wattle Street entry and exit ramps. Compared to the indicative layout presented in Chapter 6 (Construction work) of the EIS for this site, this would reduce potential construction impacts such as noise and vibration and dust and would also allow for realisation of the M4 East urban design and landscaping outcome for this area at the completion of the M4 East project

- Provision of a heavy vehicle truck marshalling facility at the White Bay civil site (C11) at Rozelle, which would cater for around 40 heavy vehicles and stage the release of trucks to the tunnelling sites to manage the arrival of trucks to construction ancillary facilities (see **Part D** (Preferred infrastructure report)). Provision of a truck marshalling facility and additional construction workforce parking would result in several benefits for the community and the project, including:
  - Reducing potential queuing, idling, circling and congestion on local roads surrounding the project and associated construction ancillary facilities
  - Providing additional construction workforce parking spaces, which would minimise construction workers parking on local roads
  - Minimising disruptions to the road network around construction ancillary facilities and noise and other disturbance to the local community including residential, business and commercial properties
  - Improving safety for construction workers, motorists and the general public by providing a controlled area from which project traffic schedulers can manage trucks and direct truck drivers to the construction sites at an appropriate time
- Designing acoustic sheds with consideration of the activities that will occur within them and the relevant noise management levels in adjacent areas. Monitoring will be carried out to confirm that the actual acoustic performance of the sheds is consistent with predicted acoustic performance (see environmental management measure NV7 in **Chapter E1** (Environmental management measures))
- The appointment of a suitably qualified and experienced Acoustics Advisor, who is independent of the design and construction personnel, and who will be engaged for the duration of construction of the project (see environmental management measure NV1 in **Chapter E1** (Environmental management measures))
- Use of the M4 East and New M5 tunnels for spoil haulage when they become available and where practicable, to minimise heavy vehicle movements on the surface road network
- Consideration of giving receivers that qualify for assessment for at-receiver treatment in relation to operational noise, that are also predicted to experience significant exceedances of noise management levels due to construction, priority preference for assessment for treatment based on the severity and timing of impact (see environmental management measure NV9 in **Chapter E1** (Environmental management measures)).

Specific management and mitigation will be documented in relevant construction environmental management sub-plans such as the Ancillary Facilities Management Plan (AFMP) and the Construction Traffic and Access Management Plan (CTAMP). This will include detailed consideration of the types of activities that would be most likely to cause longer duration impacts during construction of the project, the types of impacts already experienced by these communities as a result of M4 East and New M5 construction, and subsequent development and implementation of location and activity specific mitigation that considers the consecutive nature of construction at these locations.

Construction program at Rozelle civil and tunnel site (C5) and The Crescent civil site (C6)

Tunnelling, spoil handling and spoil haulage would occur 24 hours a day, seven days per week at the Rozelle civil and tunnel site (C5). These hours are required to shorten the overall duration of the construction program and reduce potential prolonged disruption and amenity impacts to the affected communities.

As noted above, civil construction works at the Rozelle civil and tunnel site (C5) and The Crescent civil site (C6) would occur between 7.00 am and 6.00 pm Monday to Fridays, and 8.00 am to 1.00 pm on Saturdays. Some civil works outside of these standard construction hours may also be required. These activities are discussed further in **section C6.12.1**.

Any changed to construction activities would be reviewed against the environmental performance measures outlined in EIS and the Submissions and preferred infrastructure report and approval conditions, to determine whether further assessment and/or approval would be required under the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). If further assessment/approval is required, the applicable statutory process will be followed prior to the commencement of construction of the relevant aspect of the project, including consultation requirements. Should mitigation measures for environmental impacts require changes following detailed design, this will be indicated in the appropriate management plans.

Construction schedule for construction ancillary facilities at Haberfield/Ashfield

The entry and exit ramps and cut-and-cover structures being built by the M4 East project would be used to support tunnelling, including stockpiling and loading of spoil and spoil haulage for the Wattle Street civil and tunnel site (C1a). As described in section 6.5.2 of the EIS, there is also the potential to use this site for tunnelling and tunnel support only, which would mean that the construction area at the surface between the Wattle Street carriageways would not be needed for M4-M5 Link construction purposes.

Construction works at Haberfield for the M4 East are anticipated to conclude in Q1 2019. For Option A, construction works for the M4-M5 Link at Haberfield would commence in Q3 2019 and so there would be no overlap with the M4 East project (refer to Table 6-6 to Table 6-8 of the EIS). For Option B, construction works for the M4-M5 Link at Haberfield would commence in Q4 2018 and so there would be a six month overlap with the M4 East project (refer to Table 6-9 to Table 6-11 of the EIS).

The timing of civil works to integrate the tunnels with the surface road network at the Wattle Street interchange would be confirmed as part of detailed construction planning during detailed design. Roads and Maritime as the proponent would be ultimately responsible for the delivery of the works and the management of the design and construction contractor(s).

Site establishment works

Site establishment works for major infrastructure are typically commenced before the start of substantial construction to make ready the key construction sites, including construction ancillary facilities, and provide protection to the public. While site establishment works would commence prior to the start of substantial construction activities such as tunnelling, these works have been captured in the overall construction program for the project and are identified in each of the specific construction programs for the construction ancillary facilities in section 6.5 of the EIS. Site establishment works will be undertaken in accordance with the relevant conditions of approval for the project.

C6.1.2 Construction staging

Submitters queried the reasoning behind staging the construction of the project. Specific concerns included:

- The staged construction and opening of the project
- The Rozelle interchange will be constructed after the mainline tunnel or may not be built at all
- Overall staging of the WestConnex program of works allows the program to become open ended and shift between stages
- The potential for disruption at Rozelle as a result of not constructing the Rozelle interchange at the same time as the proposed future Western Harbour Tunnel project
- The project has been staged to mitigate risk and increase the attractiveness of the project for the tender process given the complexity of the Rozelle interchange.

A submitter supported the staged construction of the mainline tunnel and Rozelle interchange.

Response

As described in section 6.1.1 and section 6.1.2 of the EIS, construction would be carried out in two stages.

Stage 1 would include:

- Construction of the mainline tunnels between the M4 East at Haberfield and the New M5 at St Peters, stub tunnels to the Rozelle interchange (at the Inner West subsurface interchange) and

ancillary infrastructure at the Darley Road motorway operations complex (MOC1) and Campbell Road motorway operations complex (MOC5)

- These works are anticipated to commence in 2018 with the mainline tunnels open to traffic in 2022. At the completion of Stage 1, the mainline tunnels would operate with two traffic lanes in each direction. This would increase to generally four lanes at the completion of Stage 2, when the full project is operational.

Stage 2 would include:

- Construction of the Rozelle interchange and Iron Cove Link including:
  - Connections to the stub tunnels at the Inner West subsurface interchange (built during Stage 1)
  - Ancillary infrastructure at the Rozelle West motorway operations complex (MOC2), Rozelle East motorway operations complex (MOC3) and Iron Cove Link motorway operations complex (MOC4)
  - Connections to the surface road network at Lilyfield and Rozelle
  - Construction of tunnels, ramps and associated infrastructure as part of the Rozelle interchange to provide connections to the proposed future Western Harbour Tunnel and Beaches Link program of works
- Stage 2 works are expected to commence in late 2018 with these components of the project open to traffic in 2023.

The rationale for constructing and opening the project in stages is based on the following considerations:

- Opening the mainline tunnels to traffic earlier than the remainder of the project would assist in easing congestion along parts of Parramatta Road and provide connectivity with the other WestConnex projects as early as possible
- Allowing more time to develop the design and construction methodology for the Rozelle interchange
- Dividing the works into two construction contracts, making the scope of the project more manageable for delivery.

Although constructing the project in stages would not necessarily reduce the presence of construction activities at a specific location, it would reduce the intensity of impacts over an extended period of time such as noise, vibration and traffic as having two separate construction contracts would allow for mainline tunnel and Rozelle interchange construction to occur concurrently and largely independent of each other. Coordination between the project stages during construction would be a requirement to ensure that the cumulative impacts from both stages are managed and mitigated appropriately. This was also a key consideration by Roads and Maritime when deciding to prepare the EIS for both project stages.

Should the project be approved, the approval would be for the whole project despite the staged construction and operation of the project. The Rozelle interchange remains an integral part of the project and the overall WestConnex program of works, as described in various NSW Government policy and planning documents (refer to **Chapter C3** (Strategic context and project need) of the EIS) and as announced by the NSW Government in July 2016.

In developing construction methodologies and a construction program for the project, the aim has been to minimise the duration of the construction period while maintaining an acceptable and manageable amenity outcome for surrounding receivers as well as a manageable scope of work for contractors. This has required a balance between the speed of construction activities and the ability to reasonably and feasibly manage impacts within acceptable limits.

The staging of the project has been considered in the indicative construction program outlined in Table 6-2 of the EIS. The indicative construction program would be subject to the development of the detailed design and construction planning for the project, however the program would identify specific time periods for construction works and would not be ‘opened ended’.

The EIS seeks for approval civil construction to provide connections to the proposed future Western Harbour Tunnel, as described in section 6.1.2 of the EIS. This is with the intent to avoid future disruption to the community and road network in the area around the Rozelle interchange and to assist in delivering the new open space at the Rozelle interchange as early as possible.

The WestConnex program of works, including the M4-M5 Link, is generally being delivered consistent with the overall program contained in the *Updated Strategic Business Case* and the various EISs for each WestConnex component project.

Further information regarding the constructability of the Rozelle interchange is outlined in **section C6.1.3**.

The support for the staged construction of the project is noted.

C6.1.3 Adequacy of construction planning

Submitters raised concerns that the construction planning and construction methodology details are indicative only and lacked adequacy.

Specific issues regarding elements of the construction planning included:

- Finalised details for workforce parking, removal of on-street parking, relocation of bus stops and spoil haulage have not been identified in the EIS or within any construction plan and should be made public before project approval
- That the contractor may decide upon additional construction ancillary facilities to the 12 identified in the EIS. A request that the EIS approval condition should limit any construction facilities to those already notified and detailed in the EIS
- Additional construction activities, beyond those described in Chapter 6 (Construction work) of the EIS, should not be allowed on the basis that they are deemed 'consistent', as this would not allow further review and scrutiny from the public
- Construction site layouts, access arrangement and egress arrangements are conceptual so the exact impacts of the proposal are not clear and so additional construction activities may be added and not assessed
- Concern about loss of on-street parking spaces for residents and staff members during the construction phase of the project. The impacts of the construction phase of the project on on-street parking should be addressed in further detail and additional parking and the option of shuttle transport should be provided for the workers
- Concern regarding who would be responsible for the enabling works that may be carried out at the construction ancillary facilities.

Specific issues raised regarding the Rozelle interchange were:

- The construction plan for tunnelling under Rozelle is unclear and not transparent. The tunnelling system is complex and has not been done before. The EIS contains insufficient detail on how the tunnels will be constructed
- The indicative plan is so complex that the interchange is unbuildable and would require a new set of Australian road tunnelling standards
- There are no existing safety guidelines for the construction of the three layers of tunnels proposed at the Rozelle interchange
- The capability of Sydney Motorway Corporation (SMC) to find a contractor that can build such complex interchange safely, on time and within budget is questionable
- Concern that the project design and methodology is subject to change when design and construction contractor(s) are appointed, particularly concerned about the Rozelle Rail Yards construction site and The Crescent civil site
- Concern the Rozelle interchange is not constructible as there was a lack of expression of interest from contractors
- The indicative plans for the Rozelle interchange show one tunnel will be 15 metres from the surface
- Lack of information about the depth of excavation required for the underground tunnels

- Lack of information on how the ventilation facilities at Rozelle will be constructed
- Concern with the lack of information about the Inner West subsurface interchange and its construction methodology
- No tunnelling at Rozelle should proceed until the entire project has been approved.

Specific issues raised regarding Options A and B (Haberfield and Ashfield) included:

- Request for additional information regarding the above ground construction sites to be used in Haberfield and Ashfield. The EIS does not specify the number and detail about the construction sites that will be used in Haberfield and Ashfield. This information should be included within the Preferred infrastructure report
- Transparency regarding the construction 'options'. The EIS notes the possibility that up to six construction sites will be used at Haberfield and Ashfield
- Construction program Table 6-2 outlined in the EIS lacks any diagram of the preferred hybrid option for Haberfield/Ashfield construction site
- The site layout for civil site options at Haberfield is conceptual only and subject to change and therefore precise impacts are not known. In particular a submitter was concerned that only an indicative alignment for a power connection from the Croydon Road substation to the construction sites was provided in the EIS
- Concern about the lack of detailed construction site and work plans associated with any of the proposed Haberfield and Ashfield above ground sites
- The summary of Option A and B in the EIS does not clearly show the overlapping of construction activity and extended duration of proposed construction program with the M4 East project.

Response

Construction methodology

The construction methodology described in Chapter 6 (Construction work) of the EIS is indicative and is based on a concept design for the project. The assessment of a concept design in an EIS is a common approach and has been applied to other recent major infrastructure projects in NSW including Sydney Metro City and Southwest and CBD and South East Light Rail. Refer to **section C2.1.2** for further information regarding the assessment of the concept design for the project. The concept design and construction methodology have, however, been developed with appropriate input from a specialist advisory team with relevant construction and tunnelling knowledge and experience to ensure that they are representative and realistic.

The Secretary's Environmental Assessment Requirements (SEARs) for the project required that the EIS provide a detailed description of the project and its construction in order that the impacts are comprehensively addressed. The concept design described in Chapter 5 (Project description) of the EIS and the indicative construction methodology described in Chapter 6 (Construction work) of the EIS were prepared by a specialist technical advisory team and considered various options and reviews of functionality and potential impacts. The design, including tunnels and operational facilities, considered the best available technical information and adopted best practice environmental standards, goals and measures to minimise environmental risks.

The EIS will inform detailed investigations, planning and surveys that will be undertaken by an appointed design and construction contractor(s). The design presented by the contractor will need to satisfy technical road design requirements based on the project as described in the EIS, and be consistent with the environmental management measures and conditions of approval for the project. Aspects of the detailed design, including the Social Infrastructure Plan and UDLPs, will be developed in consultation with the public and local community and will be made available for comment. The design and construction contractor(s) will be responsible for communication and consultation with stakeholders and the community during construction, through the development and implementation of a Community Communication Strategy. In addition to these plans, construction environmental management sub-plans, such as the CTAMP, will be developed in consultation with key government agencies and stakeholders, including relevant councils.

The design and construct tender procurement process provides an opportunity to identify design and construction improvements. The detailed design will be reviewed against the concept design, EIS and approval conditions, to determine whether further assessment and/or approval would be required under the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). If further assessment/approval is required, the applicable statutory process will be followed prior to the commencement of construction of the relevant aspect of the project, including consultation requirements. Should mitigation measures for environmental impacts require changes following detailed design, this will be indicated in the appropriate management plans.

Construction ancillary facilities

Twelve construction ancillary facilities are described and assessed in the EIS. In addition, **Part D** (Preferred infrastructure report) describes and assesses an additional construction ancillary facility, the White Bay civil site (C11).

The identification of construction ancillary facilities in the EIS and in **Part D** (Preferred infrastructure report) has sought to provide key stakeholders and the community with an appreciation of the likely areas where construction sites would be located. However, as the project progresses into detailed design following the appointment of a contractor(s), additional ancillary facilities may be proposed which better align with the detailed construction methodology and/or which allow the contractor to more safely and efficiently construct the project. It is common practice that additional sites may be found and assessed and used during construction to satisfy different construction needs. Additional sites therefore may be subject to separate environmental assessment and approval, subject to the extent of environmental and social impacts. Approval pathways are described further in Chapter 2 (Assessment process) of the EIS.

Prior to the establishment of ancillary facilities that are not identified in this EIS, the contractor would need to satisfy criteria that would be identified in any relevant conditions of approval. The design and construction contractor(s) will need to assess the detailed plans for each proposed facility to identify site-specific management measures to ensure compliance with the relevant conditions of approval and environmental management measures.

During detailed design the construction plans and programs will be refined, including preparation of AFMPs, the Construction Environmental Management Plan (CEMP), traffic management plans and the layout details of construction ancillary facilities. The EIS notes commitments to develop detailed plans and strategies to manage the potential impacts that have been identified in this process. In addition to these commitments the conditions of approval will contain specific requirements regarding the managing of potential impacts, including the preparation and implementation of management plans. These plans will consider and address matters that have arisen on the other WestConnex projects.

The conditions of approval would require the preparation and execution of a CTAMP. This plan will be prepared by the contractors in consultation with relevant agencies and specialists and require approval from the Secretary prior to construction to ensure that it includes relevant commitments and addresses applicable conditions of approval.

The CTAMP will provide the details on workforce parking, removal of on-street parking and relocation of bus stops. The majority of the construction ancillary facilities nominated for the project would have parking provision for construction workers. However, this would not meet the full needs for construction workforce parking expected to be generated by the project.

The CTAMP will include a car parking strategy for construction staff at the various worksites (see environmental management measure TT04 in **Chapter E1** (Environmental management measures). This will include the promotion of public transport and carpooling to reduce worksite-related vehicle movements. The strategy will be developed to limit impacts on the surrounding communities and would include the parking management measures that would be implemented on adjacent local streets. Construction sites are readily accessible from existing public transport services including bus and light rail.

Potential impacts on parking and the public transport network during construction are outlined in section 6.6 and section 6.7 of the EIS. Refer to **section C8.8** for a response to queries about construction impact to parking. The indicative peak construction workforce at each site is detailed in Table 6-25 of the EIS. Indicative spoil routes are described in section 6.6.5 of the EIS.

Rozelle interchange

While the Rozelle interchange is comprised of a complex system of tunnels, the concept design has been prepared by a multi-disciplinary technical team and has been rigorously tested to ensure the design is constructible and that impacts are able to be managed within acceptable limits. This includes consideration of the underlying geology to ensure it is conducive to the proposed design and construction techniques. There is sufficient separation between the tunnel tubes to ensure ongoing ground stability and integrity. In the area to the north of the Rozelle Rail Yards the proposed tunnels are located in competent bedrock (Hawkesbury Sandstone) which is conducive to tunnelling. The proposed design and construction methodology is therefore considered feasible.

The design and construction contractor for the Rozelle interchange would be selected based on various criteria, including their ability and capacity to deliver the project in a safe, timely manner and to provide value for money. The design presented by the design and construction contractor will need to satisfy all technical road design requirements and road functionality as described in the EIS and this Submissions and preferred infrastructure report, and to be consistent with the approved scope of the project, including the environmental management measures and conditions of approval for the project.

An indicative description of the likely tunnel excavation process is provided in section 6.4.2 of the EIS and is discussed further in **section C6.2.1**.

Tunnels of depths less than 20 metres below ground level would be located at Lilyfield and Rozelle north of the Rozelle Rails Yards (for the Rozelle interchange) and at Victoria Road for the Iron Cove Link, as shallow tunnelling is required to integrate tunnels with the surface road network at City West Link, Anzac Bridge and Victoria Road. The indicative depth of the tunnels at the Rozelle interchange is shown in Figure 6-12 and in Appendix E (Geological long-sections) of the EIS.

A preliminary assessment was carried out to assess the potential for ground movement and angular distortion (from differential settlement) as a result of the project, as described in section 12.3.4 of the EIS. The assessment considered tunnel excavation induced settlement only and not settlement associated with groundwater drawdown. The preliminary assessment identified that over the majority of the tunnel alignment, predicted ground movement would be less than 20 millimetres which would be consistent with the criteria. There are a number of discrete areas to the north and northwest of the Rozelle Rail Yards, to the north of Campbell Road at St Peters and in the vicinity of Lord Street at Newtown where ground movement above 20 millimetres is predicted. These discrete areas generally coincide with areas of shallower tunnelling and/or where multiple tunnels are located close to each other. They include the following areas around the Rozelle interchange:

- To the north of Lilyfield Road at Rozelle in the vicinity of Denison Street in an established residential area and Easton Park (open space area) where multiple tunnels are located and settlement in the range 20 to 35 millimetres is predicted
- To the north of Lilyfield Road at Rozelle in the vicinity of the Lamb Street where settlement in the range 20 to 30 millimetres is predicted.

Preliminary assessment of angular distortion has not identified any areas within the project footprint where the angular distortion is steeper than 1 in 500 (gradient of slope). The areas with the highest predicted angular distortion occur in the vicinity of the Wattle Street interchange ramps at Haberfield and the St Peters interchange ramps within Campbell Road at St Peters but in both locations the relevant criteria is not predicted to be exceeded.

Ground settlement will be managed to comply with the accepted settlement, angular distortion and limiting tensile strain criteria, wherever possible. Prior to and during construction, a range of management measures would be implemented to ensure that ground movement impacts are managed. These measures are described in **Chapter E1** (Environmental management measures). In addition, a range of design options are available to minimise settlement in areas where ground movement in excess of the relevant settlement limits are predicted (refer to section 12.3.4 of the EIS).

The Inner West subsurface interchange is a section of the M4-M5 Link mainline tunnels where the subsurface connections to the Rozelle Interchange would be located. The Inner West subsurface interchange would be constructed using the same excavation and construction methods adopted for the rest of the tunnels and subsurface road features associated with the project. The indicative depth of the tunnel for the Inner West subsurface interchange would be generally greater than 35 metres below ground, with some sections between 20 metres and 35 metres below ground.

As described in section 6.4.4, construction of the ventilation facilities would generally include:

- Excavation, footing and base slab installation

- Erection of precast or in situ poured concrete wall panels for shaft structure stability
- Installation of precast floor or in situ poured elements at the fan room and damper levels
- Installation of roof panels and stair structures for maintenance, access and monitoring of the facilities
- Fixture of façade support structures to shaft walls as per architectural and urban design requirements
- Internal fitout of plant areas, equipment installation and commissioning.

Construction works at Haberfield and Ashfield

As described in section 6.5.1 of the EIS, 12 construction ancillary facilities have been described and assessed in the EIS, including five sites as Haberfield and Ashfield:

- Wattle Street civil and tunnel site (C1a)
- Haberfield civil and tunnel site (C2a)/Haberfield civil site (C2b)
- Northcote Street civil site (C3a)
- Parramatta Road West civil and tunnel site (C1b)
- Parramatta Road East civil site (C3b).

The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design and would consider the:

- General principles for construction outlined in section 6.1.1 of the EIS
- Environmental performance outcomes stated in the EIS and the Submissions and preferred infrastructure report
- Relevant guidelines including noise goals identified in the EIS
- Criteria for final construction site layouts and access arrangements as listed in section 6.5.1 of the EIS
- Environmental management measures identified in **Chapter E1** (Environmental management measures)
- Relevant conditions of approval.

Based on community feedback and concerns raised in submissions on the EIS, a number of refinements to the construction ancillary facilities at Haberfield and Ashfield have been made to further minimise impacts on the community and sensitive receivers. This includes:

- Wattle Street civil and tunnel site – the area at the surface is currently being used as a construction zone for the M4 East project and would no longer be used. Construction activities would be limited to the Wattle Street entry and exit ramps
- Haberfield civil site – footprint reduced and the site would be used as a civil site only as per the arrangement for the Haberfield civil site (C2b). The C2a option would therefore not be used for the construction of the project. No tunnelling from this site is proposed.

These refinements would allow landscaping and urban design works associated with the M4 East UDLP and Residual Land Management Plan in the area around Wattle Street and Walker Avenue at Haberfield to be carried out at the completion of M4 East construction.

The appointed design and construction contractor(s) may choose to use all or some of the construction ancillary facilities identified in the EIS, including any combination of the Option A and Option B facilities at Haberfield/Ashfield. The construction ancillary facilities proposed to be used by the contractor will be documented in an AFMP which would be approved by the Secretary of DP&E.

Cumulative impacts associated with the M4 East project are assessed in Chapter 26 (Cumulative impacts) and discussed in **section C6.1.1**. In Chapter 26 (Cumulative impacts), Figure 26-3 shows a program which details how the construction period for the two projects overlap. Part of the justification for the inclusion of the Option B construction ancillary facilities is to minimise the extended duration of construction impacts on receivers adjacent to the Option A sites such as along Wattle Street, Walker Avenue and Northcote Street due to consecutive project construction for the M4 East and M4-M5 Link projects. Notwithstanding this, the Parramatta Road West civil and tunnel site (C1b) would be adjacent to a construction site for the M4 East project, which would mean nearby receivers, particularly around Bland Street at Ashfield, would be subject to consecutive construction impacts (refer to section 4.6.2 of the EIS for further information).

The area of interest for the utility corridor for the construction power connection at Haberfield is detailed in section 4.1 of Appendix (Utilities Management Strategy) of the EIS. The utility corridor would be refined during detailed design to reflect:

- Ongoing utility investigations and the specific requirements of the utility service provider (Ausgrid)
- Ongoing refinements to the M4-M5 Link project design
- Outcomes of stakeholder and community consultation
- The requirements of the design and construction contractor(s).

Refer to Appendix F (Utilities Management Strategy) of the EIS for further information regarding the management of utilities for the project.

Table 6-2 of the EIS is an indicative program for the two stages of the project (mainline tunnels and Rozelle interchange). Construction programs for individual construction sites are detailed in section 6.5 of EIS, including Table 6-6 to Table 6-11 of the EIS for the construction ancillary facilities at Haberfield/Ashfield.

C6.1.4 Construction of the interfaces with the M4 East and New M5 projects

A submitter was concerned that page 6-6 in section 6.1.2 (Construction staging) of the EIS referred to the M4 East and New M5 EISs but did not provide any details.

Response

As discussed in section 6.1.2 of the EIS, Stage 1 of the proposed construction for the M4-M5 Link project would include construction of mainline tunnels between the M4 East at Haberfield and the New M5 at St Peters. The M4 East and New M5 projects were subject to separate assessment and planning approval by DP&E and are currently under construction. Therefore details on the construction of these projects are not in the scope of the M4-M5 Link EIS and are contained in the EISs prepared for these projects, as well as related management plans and subsequent modifications. Information on the current status of these projects can be found on the WestConnex website. The EISs for the M4 East and the New M5 projects are available on the NSW Major Projects website[1].

C6.2 Construction activities

Nine submitters have raised issues regarding the construction methods. Refer to section 6.4 of the EIS for details of construction activities.

C6.2.1 Demolition methods

Submitters raised concerns over the demolition methods that are proposed for the demolition of buildings near Rozelle Public School.

[1] http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6307

Response

The Iron Cove Link civil site (C8) is located around 140 metres west from the nearest boundary of Rozelle Public School on the opposite side of the Victoria Road. Victoria Road and commercial properties are located between the school and the proposed construction facility. Construction activities to be carried out at the site include the demolition of some existing commercial and residential buildings on the southern side of the site. It is expected these would be undertaken in the site establishment phase of the construction work at this site. Although the exact method of demolition of buildings will be confirmed by the design and construction contractor(s) prior to construction, this is typically carried out using large equipment such as excavators or bulldozers. The demolition process will employ environmental management measures as described in **Chapter E1** (Environmental management measures) to minimise impacts on the local community. These include:

- Demolition activities will be planned and carried out to minimise the potential for dust generation (see environmental management measure AQ16)
- Adequate dust suppression will be applied during all demolition works required to facilitate the project (see environmental management measure AQ17)
- All potentially hazardous material will be identified and removed from buildings in an appropriate manner prior to the commencement of and/or progressively during demolition and in accordance with all relevant codes of practice (see environmental management measure AQ18)
- A Heritage Salvage Strategy will be prepared to identify the salvage potential of the fabric and features from heritage items and potential heritage items that will be demolished to facilitate the project (see environmental management measure NAH09)
- Utilities would be protected or relocated before or during demolition, as outlined in the Utilities Management Strategy (Appendix F of the EIS) (see environmental management measure PL14).

A hazardous materials assessment will be carried out prior to and during the demolition of buildings. Demolition works will be undertaken in accordance with the relevant Australian Standards and relevant NSW WorkCover Codes of Practice, including the Work Health and Safety Regulation 2011 (NSW) (environmental management measure CM03). Further responses to issues pertaining to Rozelle Public School are provided in **Chapter C9** (Air quality) and **section C14.3.2**. Measures for asbestos management for the project include:

- An asbestos survey will be undertaken of buildings to be demolished as part of the project in accordance with an Asbestos Management Plan. The survey will be conducted by a suitably qualified person (see environmental management measure RW13)
- Asbestos handling and management will be undertaken in accordance with an Asbestos Management Plan (or similar) in accordance with relevant codes of practice as part of the Work Health and Safety Plan and relevant NSW legislation, government policies and Australian Standards. The plan will include prior notification to adjacent communities about potential hazards (see environmental management measure RW14).

C6.2.2 Tunnelling methods

Submitters raised question regarding tunnelling methods. Specific queries raised included:

- The Great Sydney Dyke may extend into the Rozelle area in the alignment of the Rozelle tunnel extension at Iron Cove
- Lack of information on the existing geology and geotechnical conditions for the tunnelling
- Concern regarding the adequacy of the geological assessment. It does not take into account all the geological formations in the area and does not reference a number of important reference papers
- Lack of information regarding the nature and extent of the proposed rockbreaking for tunnelling
- Uncertainty regarding what tunnel excavation methodology will be used in reference to Chapter 6 (Construction work) of the EIS. There is concern that the method of construction will change once the contractor has been appointed
- Concern that the construction of so many tunnels at shallow depths may cause collapses to the surface like the Lane Cove tunnel and potentially putting Rozelle lives at risk

- Concern that the EIS does not provide detail on how spoil will be transported from the mainline tunnels to the surface (ie by truck or conveyor belt).

Response

The construction methodology for tunnelling was selected considering methods commonly adopted for road tunnelling, geological conditions along the alignment, the road geometry and cross-sectional dimensions of the project tunnels. Another key factor considered in the construction methodology was minimising the length of the construction period and the duration of construction activities, which in turn assists in minimising the duration of impacts on nearby receivers during construction.

The geology underlying Rozelle is conducive to the proposed design and construction techniques. There is sufficient separation between the tunnel tubes to ensure ongoing ground stability and integrity. In the area to the north of the Rozelle Rail Yards the proposed tunnels are located in competent bedrock (Hawkesbury Sandstone) which is conducive to tunnelling. Other geological forms (such as the dykes as identified in section 4.6.6 and section 4.7.3 of Appendix T (Technical working paper: Groundwater) of the EIS) will be responded to appropriately to ensure the safety of the construction team and local community.

The existing geological environment for the project is described in section 19.2.3 of the EIS. Regionally, the project footprint is located within the Permo-Triassic Sydney Basin, which is characterised by sub-horizontal sedimentary sequences, mainly sandstone and shale. The project footprint is underlain by two main geological units (bedrock units), Ashfield Shale and Hawkesbury Sandstone. The description of the existing geological environment is based on the published 1:100,000 series geological map for Sydney, Sheet 9130 (Herbert 1983) and the groundwater assessment report in section 4.6 and section 4.7 of Appendix T (Technical working paper: Groundwater) of the EIS is informed by a number of geological studies of the Sydney region as listed in section 11 of Appendix T (Technical working paper: Groundwater) of the EIS.

A description of the various tunnel construction methodologies that were considered for the project is included in section 4.6.3 of the EIS. A description of the proposed tunnel construction methodology for the project is included in section 6.4.2 of the EIS. The tunnel excavation methods would be confirmed by the contractors engaged to construct the project.

The depth of the tunnels below ground level would vary according to geological conditions and how close the tunnel is to the portals. It is anticipated that the tunnel excavation process would use a heading and bench construction methodology. This would involve:

- Excavation of the heading (top section of the tunnel) being carried out using roadheaders, launched from the tunnelling sites. A roadheader is an excavation machine consisting of a boom-mounted, rotating cutter head fitted on bulldozer-style tracks (for moving the machine around), and a loader device (usually on a conveyor)
- The bench (lower section) in the mainline tunnels could be excavated using a profiler or roadheader. Another technique that may be used for excavating the bench is by controlled blasting, which would reduce the reliance on roadheaders.

Excavation techniques, such as using rockbreakers, may be required for other excavations within the tunnels, such as for cross-passages, niches for motorway operational equipment (like substations) and for trenches along the tunnels for services and stormwater and groundwater collections.

If blasting is proposed by the appointed design and construction contractor(s), a Blast Management Strategy will be prepared in accordance with relevant guidelines before blasting begins. Any blasting activity will be subject to stringent requirements to manage potential safety and amenity related impacts. Blasting would only be undertaken underground and only in locations where the geology is suitable for safe and effective implementation.

Tunnelling and tunnelling support activities, including spoil handling and haulage, deliveries and underground construction and fitout works would be carried out up to 24 hours a day and seven days a week. Blasting (if proposed) and rockbreaking would be conducted as required during the construction period within reduced construction hours and subject to provision of respite periods. It is likely that spoil would be transported from the tunnel face to the spoil management locations within construction ancillary facilities at the surface via articulated dump trucks. Spoil would then be loaded onto spoil haulage trucks via a front-end loader.

The construction methodology described in Chapter 6 (Construction work) of the EIS is indicative only as it is based on a concept design. The specific method adopted by the design and construction contractor(s) for excavations within the tunnels will be selected based on the excavation required, technical considerations (such as geology and geotechnical properties), the potential for noise and vibration impacts and the relevant environmental management measures and conditions of approval.

Any changes to the construction methodology that would result in significantly different impacts to that presented in the EIS and **Part D** (Preferred infrastructure report) will be subject to additional assessment. The design and methodology identified by the contractors will need to be consistent with any environmental management measures, conditions of approval for the project and other requirements identified during the assessment of the project by DP&E.

The project tunnels would generally be excavated in good quality Hawkesbury Sandstone. A number of major design and construction method reviews have been undertaken to better understand historical tunnel collapses, including the collapse of the Lane Cove Tunnel in 2005 during construction and other incidents overseas. Consequently, the risks of a similar incident occurring during a Sydney tunnelling project are extremely low. The reasons for this include:

- Vastly improved geotechnical assessment and modelling
- Improved predictive two dimensional and three dimensional modelling of geology, excavation spans, temporary and permanent loads
- Fit for purpose design to develop the appropriate type of ‘support’ to match the ground conditions as the excavation progresses on a day to day basis
- Continuous independent review of the temporary and permanent works design and construction methods
- Continual construction verification that tunnel support is installed and performing as per design
- Robust change management processes for conditions that are out of the ordinary or unexpected, including probe drilling and ground treatment through suspected poor ground zones
- Continuous assessment of likely excavation and groundwater conditions
- Detailed survey monitoring of surface roads, buildings and structures in the tunnel vicinity.

Construction of the tunnels would be undertaken in sections. A ‘permit to tunnel’ system would be implemented, which would require authorisation from the tunnel construction manager (or authorised delegate) and geotechnical engineer before tunnelling is allowed to continue to the next section. The 'permit to tunnel' authorisation considers the anticipated and observed ground support performance, and geotechnical and groundwater conditions. This would minimise the risk of tunnel collapse.

C6.3 Construction Option A and Option B at Haberfield/Ashfield

Six submitters have raised issues regarding the Option A and Option B construction ancillary facilities.

C6.3.1 Spoil haulage and construction traffic management

Submitters have raised queries regarding spoil traffic management during the construction phase, including a request that spoil haulage hours at Haberfield/Ashfield (Option A and Option B) be reduced from 24 hours a day, seven days a week. In particular, request for restrictions during school zone hours.

Response

Tunnelling and associated tunnelling support construction activities (including spoil haulage) around Haberfield and Ashfield would occur 24 hours per day, seven days per week. Further detail about construction workforce hours is provided in **section C6.12.1**.

Construction traffic routes to and from construction ancillary facilities are generally along arterial roads (such as City West Link, Wattle Street, Victoria Road, Parramatta Road and the Princes Highway) and motorways. The contribution of construction related heavy and light vehicle traffic would be relatively minor compared to existing background traffic flows along the majority of construction haulage routes including at Haberfield/Ashfield.

Long-term traffic control plans, temporary works and traffic staging plans, will be subject to independent road safety audits that will be carried out in accordance with *Road Safety Audits Guide* (TC2003/RS03) (Roads and Maritime) and with reference to current practices outlined in Austroads *Road Safety Audit Guide* (2nd Edition 2002). Road safety audits will assess the safety performance of any new or modified local road, parking, pedestrian and cycle infrastructure provided as part of the project (including ancillary facilities) to ensure that they meet the requirements of relevant design, engineering and safety guidelines, including Austroads *Guide to Traffic Engineering Practice*. The process for the carrying out of road safety audits would be detailed in the CTAMP that will be prepared for the project.

Issues identified in the road safety audit will be responded to by:

- Detailing actions taken/to be taken to address each of the issues raised
- Providing justification for proposals and actions on particular issues raised.

Measures to manage potential impacts are outlined in **Chapter E1** (Environmental management measures) including the development of a CTAMP. The overarching strategy of the CTAMP will be to:

- Ensure all stakeholders are considered during all stages of the project
- Provide safe routes for pedestrians and cyclists during construction
- Design the permanent works and develop construction methodologies so that interaction with existing road users is minimised thereby creating a safer work and road user environment
- Plan and stage works to minimise the need for road occupancy, where possible
- Develop project staging plans in consultation with relevant traffic and transport stakeholders
- Minimise the number of changes to the road users' travel paths and, where changes are required, implement a high standard of traffic controls which effectively warn, inform and guide. This will minimise confusion by providing clear and concise traffic management schemes
- Comprehensively communicate changes to roads or paths to emergency services, public transport operators, other road user groups and any other affected stakeholders
- Identify measures to manage the movements of construction-related traffic to minimise traffic and access disruptions in the public road network
- Describe a car parking strategy for construction staff at the various work sites and ancillary facilities to limit impacts on the surrounding communities. The car parking strategy described in the CTAMP will:
    - Quantify construction workforce parking demand around project work sites and ancillary facilities during site establishment and the construction phase generally
    - Identify public transport options and other management measures (such as carpooling and shuttle-buses) to reduce construction workforce parking demand
    - Identify all locations that will be used for construction workforce parking
    - Identify potential off-site areas that could be used for construction workforce parking that would be investigated and secured for use during construction where required and possible
    - Identify exclusion zones, in consultation with potentially affected stakeholders, around construction sites and facilities where construction workforce parking would be restricted
- Develop and implement a truck marshalling strategy (as part of the CTAMP) that:
    - Identifies truck marshalling areas that will be used by project-related heavy vehicles
    - Describes management measures for project-related heavy vehicles to avoid queuing and site-circling in adjacent streets and other potential traffic and access disruptions
    - Describes monitoring programs to demonstrate that project-related heavy vehicles are complying with the strategy.

C6.3.2 Justification for Option B construction ancillary facilities at Parramatta Road

Submitters raised concerns regarding the justification for the Option B construction ancillary facilities at Parramatta Road. Specific concerns included:

- Opposition to the inclusion of two construction sites on Parramatta Road without adequate justification
- Option B will result in increased cumulative impacts on more people
- A surface site wouldn't be needed at this location if all tunnelling and construction work occurred underground using existing M4 East tunnels at the Wattle Street interchange.

Response

A response to the identification and selection of construction ancillary facilities at Haberfield/Ashfield is provided in **section C6.1.3**.

Use of the Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) would result in a substantially shorter temporary access tunnel to connect to the mainline tunnels than that which would be required from the existing construction ancillary facility at Haberfield that is currently being used for M4 East construction (the Northcote Street tunnel site (C7) as described in the M4 East EIS). The benefits of minimising the construction access tunnel length include:

- Program efficiencies by enabling tunnelling of the mainline tunnels to commence before construction work for the M4 East has been completed in 2019
- Allowing tunnelling to be undertaken from two locations at the same time.

The Parramatta Road West civil and tunnel site (C1b) and Parramatta Road East civil site (C3b) are located on land already owned by Roads and Maritime. The land has previously been used for commercial purposes and is located outside the Haberfield Heritage Conservation Area.

Cumulative impacts would be associated with the Option B construction sites and the M4 East at the following surface areas of overlap between the two projects:

- The M4 East ventilation facility on the corner of Parramatta Road and Wattle Street at Haberfield
- The M4 East Parramatta Road tunnel portals and ramps to the east of Bland Street.

Longer duration construction impacts are also expected where the project connects to the M4 East and New M5 projects at Haberfield/Ashfield and St Peters respectively. Longer duration impacts are discussed further in **section B1.3.3**. Chapter 26 (Cumulative impacts) of the EIS provides a detailed overview of the cumulative impact assessment or the project. Furthermore, respective technical working papers included in Appendix H (Technical working paper: Traffic and transport), Appendix J (Technical working paper: Noise and vibration) and Appendix I (Technical working paper: Air quality) of the EIS include consideration of consecutive and concurrent (cumulative) impacts during construction and operation of the project. The outcomes of the respective assessments of cumulative impacts were then used to inform the development of management and mitigation measures (see **Chapter E1** (Environmental management measures)).

Roads and Maritime acknowledge that the impacts from construction of the WestConnex program of works at Haberfield/Ashfield and St Peters are not short term, as the consecutive construction of components of the WestConnex projects would extend the duration of impacts to a period of up to seven years for some receivers in these areas. The range and intensity of impacts have and would continue to vary during these periods as construction progresses, with the majority of impacts occurring or expected to occur as a result of certain construction activities and during certain times of the day (for example outside standard daytime construction hours).

Surface construction ancillary facilities are required for the Option B construction sites to provide adequate areas for temporary site offices, workshop and storage facilities, laydown areas, workforce amenities, other temporary infrastructure for construction (such as a temporary substation, temporary ventilation for the tunnels, a temporary water treatment plant and sediment pond at the Parramatta Road West civil and tunnel site (C1b)) and car parking. Not all construction works at the site could realistically be undertaken underground. Spoil haulage routes would take advantage of the M4 East tunnels once operational as far as practicable to minimise heavy vehicles using the surface road network.

C6.4 Darley Road civil and tunnel site (C4)

462 submitters have raised issues regarding the Darley Road civil and tunnel site (C4).

C6.4.1 Traffic management

Submitters have raised questions regarding traffic diversions at the Darley Road civil and tunnel site (C4). Specific issues raised included:

- How traffic would be managed around the Darley Road civil and tunnel site (C4), including on Foster Street
- Whether heavy and light trucks would use Foster Street to access the Darley Road civil and tunnel site
- Whether the temporary traffic diversions along Darley Road would occur at night and which streets would be impacted by the diversions
- Concern regarding the suitability and safety of the proposed access/egress and truck movements around Darley Road civil and tunnel site (C4)
- The proponent has failed to consider alternative options for spoil haulage routes at Darley Road
- Spoil haulage vehicles should not be permitted turn right from City West Link into Darley Road
- The EIS is not clear on how continued access, pedestrian and cyclist movement will be preserved around the site as suggested in the EIS.

Response

Consultation with the community and key stakeholders on the concept design for the M4-M5 Link has been carried out prior to and during the exhibition of the EIS. This feedback has highlighted concerns with the use of the Darley Road civil and tunnel site (C4) during construction in the configuration presented in the EIS. Concerns included:

- The use of Darley Road by construction traffic (in particular trucks) and associated impacts, including:
  - Impacts on the performance of the road network, including the City West Link/James Street/Darley Road intersection
  - Safety impacts on other motorists and pedestrians
  - Changes to access, including *Disability Discrimination Act 1992* (Commonwealth) (DDA) compliant access, to nearby amenities including the Leichhardt North light rail stop
- Noise impacts on nearby receivers from construction traffic and construction activities occurring within the site.

Refinement of the design of the Darley Road civil and tunnel site (C4) has been undertaken in response to the concerns outlined above and would involve:

- Changes to the haulage route for incoming construction traffic. Heavy vehicles would travel eastbound along City West Link, use James Craig Road to circle back to City West Link (westbound) and use the existing left turn into James Street/Darley Road (see **Figure C4-1**). As a result, the proposed temporary construction vehicle only right turn arrangement from City West Link into James Street/Darley Road would be removed
- Establishment of a dedicated right turn bay for heavy vehicles to enter the site from the existing westbound carriageway of Darley Road while not impeding the movement of through traffic.

See **section C4.18.1** for further information including a figure showing the proposed new haulage route. The acoustic shed will be designed with consideration of the activities that will occur within and the relevant noise management levels in adjacent areas. Monitoring will be carried out to confirm that the actual acoustic performance of the sheds is consistent with predicted acoustic performance.

Foster Street is a classified road deemed suitable for use by heavy vehicles. However, spoil haulage vehicles would not use Foster Street, with ingress and egress via Darley Road and City West Link. Notwithstanding this, other heavy vehicles delivering materials, plant and/or equipment may use Foster Street, although use of Foster Street is anticipated to be limited due to the proximity of the Darley Road civil and tunnel site (C4) to City West Link. Light vehicles may use Foster Street to access the site.

Temporary traffic diversions to local streets from Darley Road may occur at night to minimise traffic safety impacts and disruption to the local traffic network. The diversions would only impact a limited section of Darley Road and would occur for limited periods, most likely for works to alter street conditions and create access into the Darley Road civil and tunnel site (C4) at the start and end of the construction period. This would require a road occupancy licence which would likely require works to be carried out outside standard construction hours when traffic volumes are low, to avoid traffic disruption. Such works would only be required early on in the construction program, and potentially again at the end of construction. The need to carry out works that would result in diversions on nearby roads would be limited as works would generally be able to be carried out within the confines of the site.

Where required, diversions would use local streets around Darley Road. Local streets including Francis Street, Hubert Street, Charles Street and William Street are relatively wide and have adequate capacity to handle additional traffic from temporary diversions. Streets used for diversions will depend on the nature and location of the proposed works for which the diversions are required. Diversions would be implemented for the duration of the work shift and access along Darley Road would be reinstated at the completion of the work shift. Residents in the area would be provided with advanced notification of any diversions and traffic management measures would be implemented. Works outside of standard construction hours, including traffic diversions, are required to minimise potential impacts on the operational integrity and functionality of the road network. These works would be temporary and governed by the Transport Management Centre.

An out-of-hours work protocol will be developed by the design and construction contractor(s) as part of the Construction Noise and Vibration Management Plan (CNVMP) in, consultation with DP&E and the NSW Environment Protection Authority (NSW EPA). This protocol will set parameters around how work outside standard daytime construction hours will be carried out, including timing and frequency, and the mitigation measures that will be implemented based on predicted impacts identified through location and activity specific assessments.

Indicative modifications to pedestrian and cyclist facilities during construction around the Darley Road civil and tunnel site (C4) are described in Table 6-20 of the EIS, including:

- Temporary closure of the footpath on the northern side of Darley Road at Leichhardt may be required, between around Canal Road and Darley Road. This would be most likely to occur during site establishment, when access to the Darley Road civil and tunnel site (C4) is being established. This footpath would be reopened as soon as possible for the balance of the construction period.
- The footpath along the southern side of Darley Road would remain open at all times, and would act as an alternative to the northern footpath during temporary closures
- There is an on-road cyclist route on Darley Road at Leichhardt that connects to the Lilyfield Road commuter route via the City West Link/James Street intersection. No diversions would be required
- Traffic management measures would be implemented at the entry and exit driveways to manage potential interactions between construction traffic and pedestrians and cyclists
- The project would not affect the existing pedestrian path that runs along the southern side of City West Link and connects the Leichhardt North light rail stop with Charles Street at Lilyfield (via the bridge over City West Link).

The existing access (stairs and lift) to the Leichhardt North light rail stop would not be impacted during construction.

C6.4.2 Site access and design

Submitters raised concerns regarding site access and the design of the Darley Road civil and tunnel site. Specific queries included:

- The EIS lacks detail about what is proposed for the Darley Road construction site

- Submission believes the EIS does not provide details of the access tunnel from the Darley Road site to the mainline tunnel only the depicted route
- Submission would also like to know the duration of use for the construction access tunnel
- The EIS does not specify which works will be carried out to establish the Darley Road civil and tunnel site during standard construction hours
- The proposed Darley Road civil and tunnel site will require local streets to be dug up to connect it to the electricity substation on Balmain Road
- Objection to any night work at Darley Road civil and tunnel site
- The site plans do not adequately address internal vehicle manoeuvring for large trucks within the site
- The Darley Road civil and tunnel site is unsuitable for the removal of spoil by large trucks due to its location in relation to City West Link
- The EIS does not adequately describe the components and activities proposed at the Darley Road civil and tunnel site.

Response

The Darley Road civil and tunnel site (C4) is described in section 6.5.8 of the EIS and proposed refinements to the design at this site are summarised in **section C6.4.1**. The site would be used for tunnelling support during construction, and for construction of the Darley Road motorway operations complex (MOC1). During construction the site would include a temporary access tunnel that would provide for construction access to the mainline tunnels, temporary site offices, a workshop and storage facilities, a laydown area, entry and exit points for construction traffic, an acoustic shed, a temporary substation, temporary ventilation for the tunnels, a temporary water treatment plant and sediment pond, workforce amenities and car parking. During operation, the site is proposed to accommodate permanent infrastructure including a water treatment facility and substation.

The temporary access tunnel to the mainline tunnel is shown in Figure 6-20. The access tunnel would initially follow the alignment of James Street before turning west to connect with the mainline tunnel. Roadheaders would be launched from the Darley Road site and would excavate the temporary access tunnel and the mainline tunnels. The access tunnel would be constructed in accordance with the tunnel excavation methodology for the other project tunnels. The access tunnels would be constructed at an appropriate depth to connect to the mainline tunnel which would be around 40 metres below ground surface at the connection point (Refer to Figure 3 of Appendix E (Geological long-sections) of the EIS. The access tunnels would be used throughout construction to support tunnelling and subsequent fitout of the mainline tunnels. The indicative duration of these construction activities is shown in Table 6-12 of the EIS.

The proposed electricity supply point for the Darley Road civil and tunnel site (C4) is the Leichhardt substation on Balmain Road, opposite the corner of Derbyshire Road (around 850 metres to the south east of the construction site). The area of interest for the utility corridor for construction power is shown in Figure 4-2 of Appendix F (Utilities Management Strategy) of the EIS. The final alignment would be determined in consultation with Ausgrid during detailed design.

The existing utilities at Darley Road, Leichhardt are summarised in Table 3-3 of Appendix F (Utilities Management Strategy) of the EIS, along with proposed management measures for the utility works. Typical environmental management measures to manage utility works are identified section 10.1 of Appendix F (Utilities Management Strategy) of the EIS.

Potential impacts from spoil haulage from the Darley Road civil and tunnel site (C4) have been considered in the EIS. Spoil handling associated with tunnelling supported by the Darley Road civil and tunnel site (C4) would occur 24 hours a day, seven days a week. Spoil would be handled below ground wherever practicable to reduce the potential for amenity impacts in adjacent areas. Spoil handing at the surface outside standard day time construction hours would occur within an acoustic shed to manage potential amenity impacts. Spoil removal from this site would only occur within standard construction hours, between 7.00 am and 6.00 pm Monday to Friday, and between 8.00 am and 1.00 pm on Saturdays. Spoil haulage routes will be identified and communicated, along with site access requirements and restrictions, to all drivers to minimise impacts on the road network from spoil transport (see environmental management measure TT15 in **Chapter E1** (Environmental management measures)).

Temporary traffic diversions may occur at night to minimise traffic safety impacts and disruption to the local traffic network. Works outside of standard construction hours are appropriate to minimise potential impacts on the operational integrity and functionality of the road network. See **section C6.4.1** for further detail regarding potential out-of-hours works.

Site establishment works for major infrastructure are typically commenced before the start of substantial construction to make ready the key construction sites, including construction ancillary facilities, and provide protection to the public. These works would be undertaken within standard hours wherever possible, however temporary traffic diversions may occur at night to minimise traffic safety impacts and disruption to the local traffic network as described above.

The indicative program for the Darley Road civil and tunnel site (C4) is shown in Table 6-12 of the EIS and in **Table C6-1**. Heavy vehicles would enter and exit the site according to the updated haulage route in **Figure C4-1**. Heavy vehicles would turn right from Darley Road to enter the site then travel east within the site before turning left to exit the site onto Darley Road and complicated manoeuvring would not be required.

Table 7-20 of Appendix H (Technical working paper: Traffic and transport) of the EIS indicates that the City West Link/James Street intersection would operate at level of service (LoS) F with or without construction traffic. The forecast construction volume is not large (150 per day or less than one per cent) in the peak periods and so the impact on the operational performance of this intersection is not forecast to be significant.

C6.4.3 Duration of construction program

Submitters raised concerns regarding the duration of the construction program at the Darley Road civil and tunnel site (C4). Specifically, Leichhardt residents were previously informed that the Darley Road civil and tunnel site would be operational for three years, however, the EIS states that it would be operational for five years. The works on the site should be restricted to a three-year program as was previously indicated.

Response

As shown in Table 6-12 of the EIS, the Darley Road civil and tunnel site (C4) would be used between mid-2018 and late 2022. The indicative construction program for the Darley Road civil and tunnel site is replicated in **Table C6-1**. Tunnelling works and tunnel fitout at the Darley Road civil and tunnel site (C4) would occur over a period of three years. The intensity of activities at the site would vary during the construction period. The majority of works associated with the Darley Road civil and tunnel site (C4) would occur either within the tunnels below ground or within the acoustic shed at the surface.

The indicative construction program may be subject to change pending detailed construction planning that would be carried out by the design and construction contractor(s). The community will be kept informed of changes to the indicative construction program in accordance with protocols outlined in the Community Communication Strategy (see environmental management measure SE2 in **Chapter E1** (Environmental management measures)). Communication and consultation with stakeholders and the community during construction would focus on providing updates on construction activities and program, responding to enquiries and concerns in a timely manner and minimising potential impacts where possible.

Table C6-1 Darley Road civil and tunnel site (C4) indicative construction program

Construction activity	Indicative construction timeframe																			
	2018				2019				2020				2021				2022			
Site establishment and utility works			■	■																
Construction of temporary access tunnel				■	■															
Tunnelling					■	■	■	■	■	■	■	■	■							
Construction of motorway operational infrastructure										■	■	■	■							
Civil and mechanical fitout											■	■	■	■						
Testing and commissioning														■	■	■	■	■		
Site rehabilitation and landscaping																		■	■	■

C6.5 Rozelle civil and tunnel site (C5)

79 submitters have raised issues regarding the Rozelle civil and tunnel site (C5).

C6.5.1 Site layout and construction methodology

Submitters raised the following concerns regarding the site layout and construction methodology for the Rozelle civil and tunnel site:

- The EIS states that project designs and construction methodologies would only be confirmed after design and construction contractor(s) have been engaged for the project. This may result in changes to the site design and construction methodology at the Rozelle civil and tunnel site
- A submitter requested that the number of light vehicle access points to the Rozelle civil and tunnel site along Lilyfield Road be minimised.

Response

The procurement process for design and construction contractor(s), including the manner in which the design of the project and construction methodologies will be further developed during detailed design, is discussed in **section C1.3.1**.

Light vehicle ingress and egress points to the Rozelle civil and tunnel site are identified in Figure 6-21 of the EIS. There would be up to five light vehicle ingress and egress points along Lilyfield Road (subject to detailed design) which are required to provide adequate access to the light vehicle parking areas within the site and allow for the layout of the Rozelle civil and tunnel site to be optimised so as to limit the need for internal access roads. While 350 daily light vehicle trips are expected to access the site, the impact would be spread along this section of Lilyfield Road having regard to the location of the driveway access points and the origins and destinations of the light vehicles. As a worst case, this would equate to an increase in two-way weekday daily vehicles of around 10 to 15 per cent depending on the location along Lilyfield Road.

C6.6 The Crescent civil site (C6)

67 submitters have raised issues regarding The Crescent civil site (C6).

C6.6.1 Site layout and construction methodology

Submitters raised concerns regarding the activities that would be undertaken at The Crescent civil site (C6) given that only after design and construction contractor(s) have been engaged would project designs and methodologies for the site be determined. Submitters were concerned that this may result in changes to the site design and construction methodology.

Response

The Crescent civil site (C6) is not proposed to be used for tunnelling. Constraints to available space at the site mean that the site would primarily be used for construction equipment laydown and access to Rozelle Bay, Whites Creek and The Crescent, in order to facilitate works associated with the realignment of The Crescent and associated works associated with the upgrade of the Whites creek channel. Chapter 6 (Construction work) of the EIS provides an indicative description of the intended use of The Crescent civil site. The indicative construction program for this site shows that it will be used between 2019 and 2021.

During detailed design the construction plans and programs will be refined, including development of an AFMP, CEMP, traffic management plans and the layout details of construction ancillary facilities. The proposed layouts of the facilities and associated environmental controls and management measures would be documented in an AFMP, which would be approved by the Secretary of DP&E prior to facility operation, and made publicly available. Further discussion regarding ancillary facilities is provided in **section C6.1.3**.

C6.7 Victoria Road civil site (C7)

One submitter has raised issues regarding the Victoria Road civil site (C7).

C6.7.1 Duration of construction program

A submitter raised the following concerns regarding the duration of the construction program at the Victoria Road civil site, querying why the Victoria Road civil site would operate for four years and querying what construction activities that would necessitate the length of the construction program at this location.

Response

The Victoria Road civil site (C7) would primarily be used for laydown, storage, site offices and amenities and to support nearby upgrades to the road network. The site would not be used for tunnelling. Key construction activities to be carried out at and supported by at the Victoria Road civil site (C7) would include:

- Support for the reconstruction of Victoria Road and the construction of the replacement bridge at the Victoria Road/The Crescent intersection, including:
  - Demolition of existing structures including buildings that have been acquired
  - Vegetation clearing and removal
  - Utility works including protection and/or adjustment of existing utilities, removal of redundant utilities and installation of new utilities
  - Establishment of site offices, amenities and temporary construction hoarding (including acoustic hoarding if required)
  - Removal of the existing pedestrian and cyclist overpass over Victoria Road
  - Finishing works including asphalting, line marking and signage installation
  - Excavating, filling and grading of disturbed areas
  - Site rehabilitation

- Rehabilitation and landscaping adjacent to disturbed areas to be consistent with the relevant Urban Design and Landscape Plan, including upgrades to the pedestrian and cyclist paths adjacent to the northbound and southbound carriageways of Victoria Road
- Demobilisation.

The reconstruction of Victoria Road and the construction of the replacement bridge at the Victoria Road/The Crescent intersection, as well as site establishment and utility works and site rehabilitation and landscaping works, are anticipated to require around four years to complete based on construction planning undertaken for the concept design.

C6.8 Iron Cove Link civil site (C8)

11 submitters have raised issues regarding the Iron Cove Link civil site (C8).

C6.8.1 Traffic management

Submitters raised concerns that vehicle movements from the Iron Cove Link civil site (C8) would include spoil haulage.

Response

There is no provision at the Iron Cove Link civil site (C8) site to operate roadheaders (as tunnel excavation of the Iron Cove Link is anticipated to occur from the Rozelle civil and tunnel site (C5) and the Iron Cove Link site is proposed as a civil site). However, the site may be used to support limited excavation of the initial sections of the Iron Cove Link tunnels (ramps and cut/cover portal sections). Heavy vehicles associated with the Iron Cove Link site (C8) would therefore transport spoil excavated from the initial tunnel sections, as well as spoil excavated from surface construction activities associated with the construction of motorway operational facilities such as the Iron Cove Link ventilation facility. As identified in Table 6-22 of the EIS, there are forecast to be 42 heavy vehicle movements per day associated with construction activities Iron Cove Link civil site (C8).

C6.9 Pyrmont Bridge Road tunnel site (C9)

Two submitters have raised issues regarding the Pyrmont Bridge Road tunnel site (C9).

C6.9.1 Parking provisions

Submitters requested details regarding the parking provisions for the 100 construction workers in the area around the Camperdown

dive site (the Pyrmont Bridge Road tunnel site (C9)).

A submitter is concerned about loss of on-street parking spaces for residents and staff members during the construction phase of the project, particularly in close proximity to the proposed dive site on Pyrmont Bridge Road.

Response

While the construction workforce would be encouraged to use public transport, a number of the project's staff and workforce would be expected to drive to construction sites and would therefore require car parking. The Pyrmont Bridge Road tunnel site (C9) would have a small number of workforce parking spaces within the site boundary (refer to Figure 6-24 of the EIS). Demand for on-site parking at this facility will exceed capacity, particularly during establishment of the facility.

Measures to manage parking impacts in adjacent streets will be addressed in a car parking strategy, included in the CTAMP to be developed for the project (refer to section 6.6.6 of the EIS). The car parking strategy will:

- Quantify construction workforce parking demand around project work sites and ancillary facilities during site establishment and the construction phase generally
- Identify public transport options and other management measures (such as carpooling and shuttle-buses) to reduce construction workforce parking demand

- Identify all locations that will be used for construction workforce parking
- Identify potential offsite areas that could be used for construction workforce parking that would be investigated and secured for use during construction where required and possible
- Identify exclusion zones, in consultation with potentially affected stakeholders, around construction sites and facilities where construction workforce parking would be restricted.

The strategy will also be developed in consultation with the M4 East and New M5 contractors to identify opportunities to use existing parking arrangements associated with those projects during their respective construction periods and once those periods are completed.

The car parking strategy will be developed as part of the CTAMP prior to the commencement of establishment and use of construction ancillary facilities. The final layout of construction ancillary sites and therefore the position and exact number of parking spaces, will be developed by the design and construction contractor(s) during the detailed design stage, and documented in an AFMP that will be prepared in consultation with relevant stakeholders as required by the conditions of approval.

The site layout would attempt to minimise the impact on existing on-street car parking along the site frontage to Parramatta Road, Pyrmont Bridge Road and Mallet Street.

An additional construction ancillary facility (the White Bay civil site (C11)) is now proposed to address concerns regarding limited construction workforce parking (see **Chapter D2** (White Bay civil site (C11))). This site would primarily provide supplementary construction workforce parking for the tunnelling sites for the mainline tunnel including the Pyrmont Bridge Road tunnel site (C9). Workers would travel from the White Bay civil site (C11) to the Pyrmont Bridge Road tunnel site (C9) via shuttle bus.

C6.9.2 Relocation of public transport stops

A submitter was concerned that the relocation of bus stops at the Pyrmont Bridge Road tunnel site (C9) was not shown in the EIS.

Response

The traffic assessment has identified bus stops that would require relocation during construction for safety reasons in section 6.6.3 of the EIS. The bus stop at Parramatta Road west of Mallet Street is not located in the vicinity of the proposed driveway entry from Parramatta Road and would therefore be retained during the construction of the project.

Any modifications to or relocation of bus stops will be reviewed during detailed design with the objective of minimising disruptions to public transport services. Any bus stop relocations would be agreed with Transport for NSW and affected bus operators. Access to existing and relocated bus stopped would be maintained throughout construction of the project.

C6.10 Construction ancillary facilities – general queries

77 submitters have raised issues regarding the location and layout of construction compounds. Refer to section 6.5 of the EIS for details of the construction ancillary facilities.

C6.10.1 Location and layout of construction ancillary facilities

General concerns were raised regarding the location and layout of construction ancillary facilities. Specific concerns included:

- Construction site layouts and egress arrangements are conceptual only and this creates uncertainty
- Requests for a more detailed visual representation of the construction sites close to the Rozelle Public School, including location of construction areas
- Requests more detail on the location and access of construction ancillary facilities.

Response

The location of construction ancillary facilities is largely determined by the location of and/or proximity to permanent operational infrastructure including tunnels, tunnel portals and ancillary infrastructure such as ventilation facilities. The establishment of construction ancillary facilities within or adjacent to permanent operational infrastructure is advantageous as it improves the efficiency of the construction program and of vehicle movements between construction ancillary facilities and construction activities in the road corridor.

The layout and access arrangements for construction ancillary facilities are based on the concept design, with the following design objectives:

- Where practicable, temporary buildings and structures (such as offices and amenities) would be used to provide a noise barrier between the construction site and adjacent sensitive receivers
- The location of temporary structures would have regard to overlooking and overshadowing impacts on adjacent sensitive receivers
- Where feasible and reasonable, acoustic sheds would enclose noise-generating activities that would be undertaken outside standard construction hours
- Lighting would be designed to minimise light spill onto adjoining properties
- Spoil stockpiles would be located away from adjacent sensitive receivers where possible
- Appropriate erosion, sediment and dust controls would be incorporated
- Vehicle access points and internal circulation roads would be located away from adjacent sensitive receivers
- Vehicle access points would have ready access to the arterial road network and heavy vehicles would generally not travel on local roads through residential areas, except during site establishment
- Construction sites would provide sufficient area for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard construction hours.

The construction methodology described in Chapter 6 (Construction work) of the EIS is indicative and is based on a concept design for the project. The assessment of a concept design in an EIS is a common approach and has been applied to other recent major infrastructure projects in NSW including Sydney Metro City and Southwest and CBD and South East Light Rail. Refer to **section C2.1.2** for further information regarding the assessment of a concept design for the project.

The SEARs required that the EIS provide a detailed description of the project and its construction in order that the impacts could be comprehensively addressed. The concept design for the project presented in the EIS was assessed using a conservative approach, which included assessing the worst case impacts and scenarios. The design, including tunnels and operational facilities, considered the best available technical information and adopted good practice environmental standards, goals and measures to minimise environmental risks.

Detailed investigations, planning and surveys will be undertaken by a design and construction contractor(s) appointed following the determination of the EIS. The design presented by the contractor will need to satisfy all technical road design and road functionality requirements as described in the EIS, and to be consistent with the approved scope of the project, including the environmental management measures and conditions of approval for the project. Aspects of the detailed design, including the Social Infrastructure Plan and UDLPs, will be made available to the public. A number of the management plans would be prepared in consultation with government agencies and local councils.

The design and construct tender procurement process provides an opportunity to identify design and construction improvements. The detailed design will be reviewed against the concept design, EIS and approval conditions, to determine whether further assessment and/or approval would be required under the EP&A Act. If further assessment/approval is required, the applicable statutory process will be followed prior to the commencement of construction of the relevant aspect of the project. Should mitigation measures for environmental impacts require changes following detailed design this will be indicated in the appropriate management plans.

The Rozelle Public School is located around 140 metres northeast of the closest boundary of the Iron Cove Link civil site (C8). The Iron Cove Link civil site layout is shown in Figure 6-23 of the EIS. Consultation with Rozelle Public School regarding potential impacts during construction would be ongoing.

C6.10.2 Potential for additional construction ancillary facilities

Submitters were concerned that there is a possibility that additional construction ancillary facilities to the 12 identified in the EIS might be added. The community will not have a chance to comment on the possible extra construction ancillary facilities. Therefore, the approval condition should limit any construction facilities to those already notified and detailed in the EIS.

Response

As described in section 6.5.1 of the EIS, 12 construction ancillary facilities have been described and assessed in the EIS, including five sites as Haberfield and Ashfield:

- Wattle Street civil and tunnel site (C1a)
- Haberfield civil and tunnel site (C2a)/Haberfield civil site (C2b)
- Northcote Street civil site (C3a)
- Parramatta Road West civil and tunnel site (C1b)
- Parramatta Road East civil site (C3b).

As described in **section C6.1.1**, the Haberfield civil site (C2b) would be progressed for the project and not the C2a option.

The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design and would consider the:

- General principles for construction outlined in section 6.1.1 of the EIS
- Environmental performance outcomes stated in the EIS and the Submissions and preferred infrastructure report
- Relevant guidelines including noise goals identified in the EIS
- Criteria for final construction site layouts and access arrangements as listed in section 6.5.1 of the EIS
- Environmental management measures identified in **Chapter E1** (Environmental management measures)
- Relevant conditions of approval.

The appointed design and construction contractor(s) may choose to use all or some of the construction ancillary facilities identified in the EIS. The construction ancillary facilities proposed to be used by the design and construction contractor(s) will be documented in an AFMP which would be approved by the Secretary of DP&E.

Additional ancillary facilities may be proposed by the appointed design and construction contractor(s). Prior to the establishment of ancillary facilities that are not approved, the contractor would need to comply with any relevant conditions of approval. Additional sites may be subject to separate environmental assessment and approval, subject to the extent of environmental and social impacts. Approval pathways are described further in Chapter 2 (Assessment process) of the EIS.

C6.11 Construction traffic management and access

145 submitters have raised issues regarding traffic management. Refer to section 6.6 of the EIS for details of the proposed traffic management and access arrangement during construction.

C6.11.1 Spoil haulage

Submitters have raised queries regarding traffic management and access during the construction phase. Specific queries included:

- Submitters wish to know the final spoil haulage routes associated with construction which are yet to be determined
- No details of this staged spoil haulage particularly:
  - The proposal at Darley Road, Leichhardt includes other options for spoil haulage
  - Spoil haulage routes for Victoria Road civil site (C7) and Iron Cove Link civil site (C8) cannot be found in the EIS
- Submitter requests that excavated material be removed on a barge via White Bay
- Requests that construction sites are located close to arterial routes for spoil haulage
- There is not adequate truck marshalling for the project
- Submitter asked for truck marshalling areas to be located away from residential properties and at White Bay instead
- Objection to the Option B Haberfield civil and tunnel site as it requires significant spoil haulage movements in the Ashfield area near Ashfield Park and Ashfield Public School
- Lack of details regarding the staging and arrival of spoil trucks
- Requests that the truck-and-dog turning circles for the proposed spoil haulage routes be checked with council
- Submitter questions if the spoil haulage route from Darley Road through to Haberfield will enter the M4 East tunnel at Haberfield
- The assessment of the impacts of spoil haulage routes to and from the Darley Road site is inadequate.

Response

Indicative spoil haulage routes for the project are described in section 6.6.5 and Table 6-23 of the EIS (a minor change to the proposed to the spoil haulage route for Darley Road is detailed in **section C6.4.1**). Impacts associated with the spoil haulage routes are considered throughout the impact assessment sections of the EIS.

An additional construction ancillary facility is proposed on a portion of the Port Authority of NSW land located near White Bay. The facility would provide a truck marshalling area for around 40 heavy vehicles and parking for the construction workforce. The facility would also provide additional space to store construction plant and machinery and materials at the site. The site is referred to as the White Bay civil site (C11). The site would reduce the potential for trucks to queue or circle on roads around construction sites (see **Chapter D2** (White Bay civil site (C11))).

The use of the White Bay civil site (C11) and the change to the spoil haulage route for the Darley Road civil and tunnel site (C4) (see **section C6.4.1**) would change some routes that heavy vehicles would use to travel to and from construction ancillary facilities. The traffic and transport impacts of these changes have been assessed in **section D2.4** and **Appendix A** (Traffic and transport impact assessment).

As described in **section C8.4.1**, **section D2.4** and **Appendix A** (Traffic and transport impact assessment), the construction of the project would not result in a significant increase in vehicle numbers on the road network. Compared to existing traffic levels, construction traffic represents a relatively small increase in traffic. Spoil haulage is therefore not forecast to significantly impact on road safety or congestion. Heavy vehicle ingress and egress to and from construction ancillary facilities identified in section 6.5 of the EIS would be via classified roads.

At Darley Road, heavy vehicles would enter the site by travelling eastbound along City West Link, use James Craig Road to circle back to City West Link (westbound) and use the existing left turn into James Street. Heavy vehicles would exit via Darley Road and then City West Link. No spoil haulage would occur from the Victoria Road civil site (C7). At the Iron Cove Link civil site (C8) heavy vehicles would enter the site by travelling northbound along Victoria Road. Heavy vehicles would exit northbound along Victoria Road. As identified in Table 6-22 of the EIS, there would be 42 heavy vehicle movements per day associated with construction activities Iron Cove Link civil site (C8).

In addition, and in accordance with section 6.5.8 of the EIS which noted that investigations into alternative access for the Darley Road civil and tunnel site (C4) were ongoing, the proponent has investigated an option of providing heavy vehicle access to/from City West Link thereby minimising the need for heavy vehicles to use Darley Road. This investigation is detailed in **section B11.6.9**. The option was not feasible given potential traffic, safety, noise, access and constructability issues.

The construction methodology and spoil haulage routes described in Chapter 6 (Construction work) of the EIS are indicative and are based on a concept design for the project. The SEARs required that the EIS provide a detailed description of the project and its construction in order that the impacts could be comprehensively addressed. The concept design for the project presented in the EIS was assessed using a conservative approach, which included assessing the worst case impacts and scenarios. The design, including tunnels and operational facilities, considered the best available technical information and adopted good practice environmental standards, goals and measures to minimise environmental risks.

The spoil haulage routes would be refined and confirmed during detailed design and construction planning and documented in the CTAMP which requires approval by the Secretary of DP&E prior to construction. The approved CTAMP will be made publicly available. Spoil management sites are identified in Table 23-7 of the EIS, however other disposal/reuse sites may be used depending on need at the time spoil is generated. In addition, there is the potential that some spoil could be removed by barge and this option if deemed feasible will be subject to further investigations during detailed design.

Traffic management measures implemented during construction will be determined during detailed design and documented in a CTAMP that will be prepared as part of the CEMP. The CTAMP will be prepared to manage construction traffic and access routes associated with the project. The contractor would be required to consult with relevant councils and key traffic and transport stakeholders in the preparation of the CTAMP.

Potential truck marshalling areas would be identified and used where possible, to minimise potential queueing, site circling and traffic and access disruptions in the local area. Trucks would be scheduled to arrive and depart so as to minimise queuing and to allow for the most efficient operation of the construction ancillary facilities.

A truck management strategy will also be developed as part of the CTAMP that:

- Describes management measures for project-related spoil haulage vehicles to avoid queuing and site-circling in local roads and other potential traffic and access disruptions
- Identifies truck marshalling areas that can be used by project-related spoil haulage vehicles
- Describes monitoring strategy to demonstrate that project-related spoil haulage vehicles are complying with the strategy.

Proposed construction sites, access driveways and spoil haulage routes are appropriate for truck-and-dog turning circles as confirmed during constructability assessments which have been carried out as part of the development of the concept design presented in the EIS. Spoil haulage routes would take advantage of the M4 East and New M5 tunnels once they are open to traffic as far as practicable to minimise heavy vehicles using the surface road network.

Potential impacts associated with spoil haulage are assessed throughout the EIS including in Chapter 8 (Traffic and transport), Chapter 9 (Air quality) and Chapter 10 (Noise and vibration) of the EIS.

C6.12 Construction workforce numbers and work hours

239 submitters have raised issues regarding hours of work. Refer to section 6.7 of the EIS for details of the proposed workforce and construction work hours.

C6.12.1 Objections and restrictions to proposed working hours

Submitters objected to works occurring after hours, including nights and on weekends and requested that construction works be limited to business hours only. In particular, the following issues were raised:

- After hours works should only be permitted in the case of actual emergencies

- Concern about the construction work hours for the project and impacts on the community
- Request for removal or reduction of out-of-hours works for the project
- Road occupations should be allowed from 7.00 pm onward to assist with implementation of the night-work curfew
- A 24 hours a day, seven days a week construction compliance hotline be established
- Objection to 24 hour, seven days a week operation of the proposed spoil haulage construction activities at the Pyrmont Bridge Road tunnel site
- Concern that the EIS allows the contractor to undertake out-of-hours work without clear rules and limits in regards to night works in the Leichhardt area
- It is unclear regarding what time the workers would arrive and depart from the Darley Road civil and tunnel site (C4). The proponent fails to provide information about the times at which late or early shifts start or end. The proponent should have disclosed when the shift workers will be arriving or departing
- At a minimum, all above ground works at the Darley Road civil and tunnel site (C4) should be restricted to standard construction hours, with no shifts ending or commencing outside of standard construction hours
- A submitter requests that the conditions of approval prohibit out of hours work at the Darley Road civil and tunnel site for more than two nights in a row and in any two-week period
- Truck movements should be limited to standard construction hours
- It is unclear what works would take place within standard construction hours
- All utility works should be restricted to be undertaken at the same time as construction works.

Response

Proposed construction hours are discussed in section 6.7.2 and set out in Table 6-26 of the EIS. The construction work hours proposed in the EIS have been developed in consideration of the need to balance minimising noise and traffic related impacts on communities with reducing impacts over the full construction program. For surface works, the preference is to work within standard construction hours to allow for longer shifts (works at night on the operational road network typically need to be established and decommissioned before and after each shift to avoid disruption to the road network during the day, reducing the time available for carrying out construction activities), ease of work and to minimise costs.

At the tunnelling sites, such as the Pyrmont Bridge Road tunnel site (C9), it is preferable for tunnelling to take place over extended hours as using standard construction hours for tunnelling (and associated spoil haulage) would result in significant extension to the duration of the construction program and resultant disturbance. An alternative option would be to establish additional roadheader launch sites in new locations with associated additional disturbance, however this option is not considered appropriate.

During tunnelling, it is necessary for newly excavated sections of the tunnel to be supported (eg via rock bolting) as quickly as possible following excavation. Depending on the specific ground conditions and geological properties present, the cycle of tunnel excavation followed by tunnel support does not always fit neatly into a standard daytime work shift. Roadheaders at the tunnel depths proposed have a low potential for disturbance given the distance away from receivers. Opportunities to further reduce construction timeframes while protecting local amenity will be considered during the detailed design process.

The contractor would be required to obtain a road occupancy licence from the Traffic Management Centre for works which:

- Slows, stops or otherwise delays traffic
- Diverts traffic from its normal course along the road carriageway, including lane closures, turning restrictions, detours and diversions
- Occupies any portion of a local road that is normally available as a trafficable lane.

Road occupancy licences would be subject to the specific period of operation stated on the approved licence and any associated conditions.

The majority of surface construction would be undertaken during standard construction hours (between 7.00 am and 6.00 pm Monday to Friday and 8.00 am and 1.00 pm on Saturdays). However, some construction activities would need to be undertaken outside standard construction hours (ie at night). When works outside of standard construction hours are required, these will need to be justified in accordance with the *Interim Construction Noise Guidelines* (ICNG) (NSW Department of Environment and Climate Change (DECC) 2009). Construction works that might be undertaken outside the recommended standard hours are:

- Utility works
- Surface works to arterial roads, such as Wattle Street, City West Link, The Crescent, Anzac Bridge, Victoria Road, to minimise impacts on peak traffic flows
- The delivery of oversized plant or structures which are determined by authorities and police to be transported at a time which minimises disruption and safety concerns
- Maintenance and repair of public infrastructure where disruption to essential services and/or considerations of worker safety do not allow work within standard hours
- When emergency work is required to avoid the loss of life, damage to property or to prevent environmental harm
- Public infrastructure works that shorten the length of the project and are supported by the affected community
- Works where a justification of the need to operate outside the recommended standard hours is accepted.

Where required, the proponent will provide the relevant authority with a clear justification for the need for out-of-hours works, such as to sustain operational integrity of the road networks. An out-of-hours work protocol will be developed to set parameters around how work outside standard construction hours will be carried out, including timing and frequency, and the mitigation measures that will be implemented based on predicted impacts identified through location and activity specific assessments.

The out-of-hours work protocol will be developed in consultation with DP&E and the NSW EPA and will be a requirement of the Environment Protection Licence (EPL) for the project. The out-of-hours work protocol will include:

- Details of work required outside standard construction hours, including justification of why the activities are required outside standard construction hours
- Measures that will be implemented to manage potential impacts associated with work outside standard construction hours in according with the ICNG and the *Construction Noise and Vibration Guideline* (CNVG)
- Location and activity specific noise and vibration impact assessment processes that will be followed to identify potentially affected receivers, clarify potential impacts and select appropriate management measures
- Details of monitoring that would be undertaken for works outside standard construction hours
- Details of the approval process (internal and external) for work proposed outside standard construction hours
- Further detail of the noise management measures are provided in **Chapter E1** (Environmental management measures).

The Acoustics Advisor (refer to environmental management measure NV1 in **Chapter E1** (Environmental management measures)) will be responsible for reviewing proposals regarding works outside standard construction hours, confirming that the works are appropriate and endorsing the proposed mitigation measures.

In addition, the EPL will regulate the amount of work that can occur outside standard construction hours. This regulation typically includes limitations such as restricting the number of nights per week on which works likely to impact on resident amenity can occur and potentially also placing curfews on particular activities or equipment use to minimise potential amenity impacts.

Section 6.7.2 of the EIS outlines the proposed construction hours for proposed construction activities as well as construction work hours at each of the construction ancillary facilities for the project.

Construction ancillary facilities that support tunnelling works will operate throughout the project to provide access to the tunnelling work areas, and to provide workforce parking, office functions, and to receive essential deliveries of plant and equipment. The most noise intensive activities will typically occur inside an acoustic shed. Works not required to directly support tunnelling will not typically occur outside standard construction hours.

Associated tunnel support activities (including spoil haulage) would also be undertaken up to 24 hours a day, seven days a week (apart from at the Darley Road civil and tunnel site (C4)). Spoil stockpiling and management would occur within acoustic sheds or cut-and-cover tunnel structures. Acoustic barriers (or similar) and other acoustic treatments would be installed as required to reduce noise propagation to adjacent areas. Concrete and shotcrete deliveries to construction ancillary facilities used to support tunnelling would also be required 24 hours per day, seven days per week, as the excavated tunnel would be progressively supported behind the roadheader by applying shotcrete to the excavated tunnel walls.

For the Darley Road civil and tunnel site (C4), construction activities that would occur at night would be limited to tunnelling and spoil handling (within an acoustic shed), and activities requiring the temporary possession of roads or to accommodate road network modifications. The network modifications would only impact a limited section of Darley Road and would occur for limited periods and would most likely occur for works to alter street conditions and create access into the Darley Road civil and tunnel site at the start and end of the construction period. Road network modifications would be undertaken at night in order to minimise traffic safety impacts and disruption to the local traffic network. The majority of the works associated with road network modifications would be associated with the initial modification and final reinstatement of the road network, which would occur around the start and end of the construction period.

It is anticipated that construction workers would generally arrive just before and just after the commencement and completion of shifts. The day shift would generally be accommodated within standard construction hours (between 7.00 am and 6.00 pm Monday to Friday and between 8.00 am and 1.00 pm on Saturdays). Shift times would be at the discretion of the design and construction contractor(s).

C6.12.2 Workforce training

A submitter requested that, as part of the conditions of approval, there be inductions, training and supervision of road traffic controllers.

Response

All road traffic controllers working on the project will be qualified with a Roads and Maritime Road Traffic Control licence. The CTAMP will be prepared in accordance with RTA Traffic Control at Work Sites Manual and AS1742.3: Manual of uniform traffic control devices – Part 3: Traffic control for works on roads, and any other relevant standard, guide or manual (see environmental management measure TT01 in **Chapter E1** (Environmental management measures)). The CEMP for the project will describe induction and training requirements for construction staff.

C6.12.3 Workforce numbers

Submitters raised concerns regarding information on workforce numbers during the construction phase of the project. Specific concerns included:

- The EIS does not provide explicit information about workforce numbers and work shifts
- There are discrepancies in Table 6-25 between the two options at Haberfield/Ashfield.

Response

The indicative peak construction workforce for the day, afternoon and night shift at each site is detailed in Table 6-25 of the EIS and refined in **Table C6-2** and has been estimated based on industry knowledge and the indicative construction methodology for the project. The construction workforce would vary throughout the construction of the project and would be at its highest during tunnelling activities and/or during the construction of key surface infrastructure and lowest during site establishment and demobilisation activities. Shift times are discussed in **section C6.12.1**.

The construction activities and programs for Option A and Option B at Haberfield/Ashfield as presented in the EIS would not be identical and therefore the construction workforce estimates did not equate to the same total workforce requirement. Subsequent refinements to the construction ancillary facilities proposed for use as part of the project at Haberfield/Ashfield (see **section C6.3**) would result in changes to the peak construction workforce estimates. Table 6-25 of the EIS has subsequently been revised, with updated estimates presented in **Table C6-2**.

Table C6-2 Peak construction workforce estimates

Site name/location	Approximate day shift peak construction workforce	Approximate afternoon shift peak construction workforce	Approximate night shift peak construction workforce
Wattle Street civil and tunnel site (C1a)	70	30	70
Haberfield civil and tunnel site (C2a)[1]	-	-	-
Northcote Street civil site (C3a)	50	30	10
Parramatta Road West civil and tunnel site (C1b)	140	40	90
Haberfield civil site (C2b)	30	10	0
Parramatta Road East civil site (C3b)	10	10	10
Darley Road civil and tunnel site (C4)	100	30	0
Rozelle civil and tunnel site (C5)	500	200	200
The Crescent civil site (C6)	50	30	50
Victoria Road civil site (C7)	200	0	0
Iron Cove Link civil site (C8)	200	0	0
Pyrmont Bridge Road tunnel site (C9)	100	30	100
Campbell Road civil and tunnel site (C10)	100	30	100

Note:
1 This site is no longer proposed to be used in this configuration

C6.13 Utilities

21 submitters raised issues regarding proposed utility works during construction. Refer to Chapter 6 (Construction work) of the EIS for a description of the proposed utility works during construction and Appendix F (Utilities Management Strategy) of the EIS.

Submitters raised the following concerns regarding utility works:

- Concern regarding the tunnelling alignment crossing key Sydney Water utilities and questions SMC as to why this is proposed. Belief there is only limited information available about the strength of the Sydney Water utilities, quoting that the EIS proposals are incomplete
- Submitter objects to any utility work within the project footprint occurring prior to the development and approval of the M4-M5 Utilities Management Strategy and CEMP
- Submitter objects to any utility works outside of the project footprint occurring before more detail is provided about the Utilities Management Strategy development
- No approval should be granted prior to further detail being provided regarding the power connection from Croydon Road substation to the Haberfield construction sites

- Recommendation for the development of a robust and independent Utilities Management Plan and CEMP
- Concern how the project would manage interface agreements with utility providers.

Response

Concerns raised regarding impacts to utilities and details of utility works are addressed in **section C12.9**.

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C7 Consultation

This chapter addresses issues raised in community submissions associated with consultation and communication of the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 7 (Consultation) of the EIS for further details on the consultation activities carried out for the M4-M5 Link project. Appendix G (Draft Community Consultation Framework) of the EIS provides further details on the approach to community consultation for the project.

Contents

C7.1 Consultation during design development and EIS preparation

2,811 submitters have raised issues regarding the level and quality of community consultation undertaken during design development and EIS preparation. See section 7.2 of the EIS for an overview of how early feedback from stakeholders and the community was used to influence design outcomes. Appendix G (Draft Community Consultation Framework) of the EIS provides further details on the approach to community consultation for the project.

C7.1.1 Timing of the public release of the concept design

Submitters raised concerns over the timing of the release of the concept design which was released four months later than originally planned. Submitters particularly raised:

- Concern that the consultation period for the concept design was not long enough to allow communities to be appropriately informed to be able to make comments
- Details of the closing date of the public exhibition on the concept design was not initially provided
- Concerns that the comments on the concept design were not reviewed and addressed in the EIS in the two weeks between the closure of the concept design public exhibition period and the release of the EIS due to the number of comments submitted and the time needed to review and address the comments in time for the commencement of the public exhibition of the EIS
- The EIS did not respond to the 1500 submissions including a 142 page submission from the Inner West Council
- Concerns that the concept design was not accessible
- Agreement with the Inner West Council's comments regarding the timing of the public release of the WestConnex Stage 3 EIS days after the consultation period short-changed the inner west community and those who will depend on transport in Sydney in the future.

Response

Consultation on the M4-M5 Link concept design was carried out during a 12 week period between May and August 2017. This non-statutory consultation period sought to provide the community and other stakeholders with information about the M4-M5 Link project before the release of the EIS, as well as the opportunity to provide feedback The timing of the release of the Concept design report in May 2017 enabled the accommodation of further changes to the project design and announcements by the NSW Government regarding the Rozelle interchange, Iron Cove Link and exclusion of ramps at Camperdown.

The release of the Concept design report for public comment was designed to ensure the information released was current and consistent with other communications about the project. The non-statutory consultation on the M4-M5 Link concept design was carried out during a 12-week period between May and August 2017. This consultation period sought to provide the community and other stakeholders with information about the M4-M5 Link project before the release of the EIS, as well as the opportunity to provide feedback. A community feedback report that addresses the main themes of feedback received during this period was prepared and made publically available on the WestConnex website, and included reference to where issues raised were addressed in the EIS.

The Concept design report was an indicative document used for consultation with the aim of providing the community and stakeholders with an understanding of the project. It was based on available information regarding the project at the time and noted that further technical investigations were underway.

It is acknowledged that the time period between the close of comments on the Concept design report and the exhibition of the EIS was limited. However, the timing of the release of the Concept design feedback report did not prevent the community's feedback from being genuinely considered in the EIS and as part of this Submissions and Preferred infrastructure report. Reasons for this included:

- The majority of feedback was received early on in the 12-week response period
- Feedback was provided to the EIS team weekly for consideration

- A consultant was engaged from the beginning of the consultation period to analyse and compile the feedback report to ensure it was ready soon after the feedback period closed
- The feedback received did not identify any significant new issues not identified during previous consultation with the community and that had not already been considered during the preparation of the EIS.

Further information on the Inner West Council's concerns is presented in **Chapter B11** (Inner West Council). Inner West Council's specific concerns regarding the timing of the release of the EIS after the closure of the public exhibition of the concept design presented in **section B11.2.2**.

C7.1.2 Level and quality of consultation pre-exhibition

Submitters raised concerns about the level and quality of consultation prior to exhibition of the EIS. Specific concerns included:

- Minimal information was provided for the Concept design report during community consultation sessions
- The quality of the community information sessions including inadequate knowledge of the project by staff members, discussion of topics beyond the expertise of respondents, failure to respond to technical queries and provision of non-specific responses and approximations. Additionally information at the sessions was inconsistent, not enough detail, misinformation with questions unanswered and often deferred to details contained in the EIS
- The community consultation at Balmain Town Hall was a 'disgraceful effort' due to the way objections were handled and the session was ended 45 minutes early
- The limit of 140 characters for commenting on interactive maps prior to lodgement of the EIS was not sufficient for detailed comments.

Submitters raised concerns about the adequacy, quality and comprehensiveness of communication materials prior to exhibition of the EIS. Specifically the following concerns were raised:

- Information presented, including consultation with the wider community in the form of television advertisements, is an idealised version of the project and was misleading, untrue and does not reflect the true outcomes of the project
- Public communication materials including brochures, flyers, social media and the website did not allow an exchange of information for consideration of community and stakeholder views
- Information in brochures and posters were inaccurate, did not provide essential details, minimised the negative aspects of the project and failed to provide any mitigation measures for the potential impacts
- Information on the WestConnex website was out of date, inaccurate and provided minimal detail
- The concept design was inadequate with maps, scales, designs and artist impressions presenting idealistic views and not realistically the final outcomes of WestConnex
- The Concept design report was an inadequate document with errors, omissions and did not provide any depth of detail for the public to be able to comment
- The level of detail provided in the master plan for the Rozelle Rail Yards and landscape treatments falls short of a reference design the government promised would be delivered prior to the release of the M4-M5 Link EIS and precludes considered feedback.

Submitters raised concerns in regards to the adequacy of consultation with particular sectors of the community. Specifically the following concerns were raised:

- Residents in the vicinity of St Peters, Erskineville, Newtown, Pyrmont, Lilyfield and the proposed Camperdown dive site and Rozelle interchange received minimal consultation in regards to:
  - Heritage impacts, additional years of construction and tunnel routes in the eastern parts of Newtown, eastern side of King Street and St Peters
  - Newsletters were not delivered to residents of central and northern Newtown, St Peters and Erskineville
  - Residents adjacent to the Pyrmont Bridge Road tunnel site (C9) were not directly consulted or invited to provide input to this stage of the WestConnex program of works

- Newtown Public School, Newtown Performing Arts High School, St Columba's Catholic Primary School were not sufficiently consulted
- Consultation with the WestConnex Community Reference Group in regards to SMC representatives having minimal technical knowledge, issues were taken on notice, questions were not answered directly, minimal representation of NSW Roads and Maritime Services (Roads and Maritime) at several meetings
- The Minister for WestConnex, Stuart Ayres, not meeting with action groups
- Residents potentially affected by the project receiving inadequate notification of the timing and location of EIS feedback sessions
- As a result of council amalgamations, the residents in Leichhardt were left with no local representation for an extended period when a significant amount of development and expansion of the WestConnex project was undertaken
- The residents of Haberfield were not appropriately consulted regarding the impacts of the M4-M5 Link
- Failure to consult with residents of western Sydney about proposed toll costs and transport preferences.

Submitters raised concerns about the engagement prior to exhibition of the EIS being genuine. Specifically the following concerns were raised:

- The legitimacy of the consultation process, misrepresentation of statistics, under-representation of the affected local residents, acknowledgement of concerns by the public and local councils, and subsequently the whole project
- Lack of advertisement of deadlines associated with submissions on documents prior to the release of the EIS
- Consultation was based on a concept design which has a high level of uncertainty for residents
- The consultation did not comply with the 'meaningful consultation' requirements as required by the Secretary of the NSW Department of Planning and Environment (DP&E)
- Information which was determined to be commercial in confidence was not disclosed for experts and public scrutiny, including the potential sale of Sydney Motorway Corporation (SMC)
- The community feels disempowered by the EIS process, believing their concerns were ignored in preceding WestConnex stages and that they are unable to influence the project
- The community was not provided with an adequate opportunity to have a meaningful discussion regarding public transport improvements and alternatives
- Concern that no real opportunity was provided for the residents to choose their preferred transport system to be constructed
- Government policy redirecting submissions directed at the Premier to the Minister for WestConnex
- Requests for a major investigation into the community consultation to be conducted.

Submitters raised concerns about the responsiveness of the project to the community's queries and issues raised prior to the commencement of the public exhibition of the EIS. This included:

- Project decisions were not made based on community feedback
- The NSW Government ignored comments made in public consultation meetings, including questions and objections. Submitters suggested that the Inner West Council and City of Sydney Council should submit a single submission to make the NSW Government take submissions seriously.

Submitters raised concerns about the transparency surrounding the project and design decisions not adequately considering or addressing concerns from community consultation prior to the EIS being exhibited. Specifically, the following issues were raised:

- The community should have been consulted about their views before the commitment to build WestConnex was made
- Concerns that the consultation process was redundant as the decisions for the project had already been made
- Conflicting information was given with the Darley Road civil and tunnel site (C4) in regards to journalists and residents received different information on different days
- Promises made by the project team during the preceding and current stages of WestConnex to the Haberfield and Ashfield communities for considering a range of construction options, including an option that would involve no additional above ground site options in Haberfield, were not considered and are not reflected anywhere in the EIS
- Residents of Haberfield and Ashfield were assured as part of Stage 1 that no further above ground construction facilities would be located in these locations, and that construction would be complete in these areas by 2019. Concerned that this was false information as residents will now see eight years' worth of construction
- The opinions of local residents, the Inner West Council and an independent engineer's report about the safety issues associated with the Darley Road site have not been acknowledged by Roads and Maritime
- Plans for the Stage 3 [M4-M5 Link] unfiltered ventilation facilities in Rozelle and St Peters have gone ahead without adequate community consultation
- Objections raised by some stakeholders were acknowledged and acted upon while others were not based on the effects a response would have on perceived safe electorates
- That the decision not to use Blackmore Park and Easton Park was not in response to community feedback, but due to their unsuitability for construction sites
- Failure to consult the community about the construction site locations prior to release of the concept design
- The M4-M5 Link Community Report identified the continuation of the tunnel through to Gladesville Bridge as out of the scope of the proposal and the reason for this was not adequately addressed although this was raised by resident's as an option they wanted to be considered
- Objects that the alignment of the tunnels under the Lilyfield area changed between the concept design and publication of the EIS but no prior notification was given to the affected resident
- The Iron Cove Link was added to the project without proper consultation.

One submitter expressed support for the detailed consultation undertaken by Roads and Maritime while preparing and submitting relevant controlled activity applications.

Response

Consultation

The community and stakeholder consultation for the project has included activities before and during the display of the EIS using a variety of communication and engagement methods. These include a website, a centralised WestConnex information telephone line, a project email and postal address, an online 'Have your say' form, community updates, newspaper advertisements, social media channels, multiple rounds of community information sessions, fact sheets, face-to-face meetings and briefings. Communication materials included information on translation services available.

Consultation during the preparation of the EIS for the project was undertaken in accordance with the State significant infrastructure provisions of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) and the Secretary's Environmental Assessment Requirements (SEARs), to incorporate meaningful and effective engagement for this stage of the project. Consultation activities targeted affected communities, including local residents and businesses, and were planned and advertised in advance.

Design considerations in response to early feedback are detailed in Table 7-2 of the EIS, including avoiding impacts to Easton Park and removal of the Camperdown interchange. A community update was distributed for the release of the concept design and also at the commencement of the EIS exhibition period. Both updates included information on how to make a submission, when/where the information sessions were being held, and how to get in contact with the project for further information. The distribution area covered approximately 130,000 residents. Suburbs reached are listed in the EIS consultation summary. Targeted efforts to provide information to residents in proximity to potential construction facilities, included:

- The offer to attend owner's corporation meetings of the unit blocks in close proximity to the Camperdown site during the concept design
- Residents in Haberfield/Ashfield and Leichhardt that were identified as 'highly noise impacted' in the EIS were doorknocked and encouraged to attend information sessions and make a submission
- Residents of Springside, Clubb, Toelle, Brynes and Callan streets were door-knocked and left a letter during the concept design phase regarding the project, seeking feedback and encouraging attendance at information sessions
- A letter was distributed to residents in Haberfield and Ashfield regarding the addition of the Parramatta Road civil and tunnel site that was included and assessed in the EIS. This letter was distributed on the 18 August 2017 and encouraged residents to attend information sessions email or call the WestConnex toll free number (1800 660 248) if they had questions.

Detailed, project specific consultation began with stakeholders following the lodgement of the State Significant Infrastructure Application Report (SSIAR) in January 2016. Following the NSW Government announcement about the new open space/parkland at the Rozelle Rail Yards and the Iron Cove Link in July 2016, a comprehensive community engagement process was carried out. Communication activities during this period included five community ideas sessions hosted in Five Dock, Leichhardt, Camperdown and Balmain as well as newsletters, advertisements in local papers, email communication drives, website question and answer section, online collaboration map and responses to feedback and questions via email, web and phone contact. This resulted in the Community feedback report released 15 November 2016 detailing community feedback and ideas gathered through this consultation during July and August 2016.

The online collaboration map which was used to support consultation for the concept design release allowed community members to pin their comments to specific areas of the map. Comments were limited to 140 characters, however community members could comment multiple times if more than 140 characters was required.

Community and stakeholders have been encouraged to contact the proponent at any time to discuss the project via phone, email, post or via the WestConnex website. Section 7.3.4 of the EIS provides further detail regarding the consultation activities undertaken with local, state and national government agencies and elected representatives during the development of the EIS.

Consultation on the M4-M5 Link concept design was carried out during a 12 week period between May and August 2017. This non-statutory consultation period sought to provide the community and other stakeholders with information about the M4-M5 Link project before the release of the EIS, as well as the opportunity to provide feedback. Consultation on the Concept design report provided the community and stakeholders with the opportunity to provide input into the design prior to the appointment of a design and construction contractor(s) and the preparation of a detailed design. Five community information sessions were held between May and June 2017, where 20-25 technical experts were in attendance and had in-depth conversations with members of the community. These took place in Camperdown, Leichhardt, Newtown, Balmain and Haberfield. See **section C2.1.2** for further discussion on the concept design.

The Concept design report was based on the most recent information at the time. It was written in plain English and used artists impressions and figures to communicate the design. The Concept design report was not intended to include the same level detail as that included in the EIS. A more comprehensive and detailed overview of the project is provided in Chapter 5 (Project description) of the EIS. The final detailed design will be communicated in the Urban Design and Landscape Plans (UDLPs) for the project. The community and stakeholders will be able to comment on the draft UDLPs during an exhibition period and the feedback will be considered in the final UDLPs, including for Rozelle Rail Yards.

The Concept design report was made available on the WestConnex website in a high resolution online version and a printable version. The website also provided information on how to provide feedback or get in touch with the project team for more information.

A mixture of communication methods were utilised to inform individuals about the consultation process, including:

- Media announcements on television, radio, print and digital news outlets
- Distribution of a community update to residents in and around the project footprint
- Direct emails to registered stakeholders
- Newspaper advertisements encouraging participation in the community sessions
- Website updates and social media.

Suburbs reached are listed in the EIS consultation summary. During consultation prior to the exhibition of the EIS, the early design of the project was refined in response to community and stakeholder feedback. The specific chapters of the EIS address community concerns, albeit not individually; however section 7-2 of the EIS provides an overview of how the feedback has been addressed. Table 7-10 of the EIS details the feedback received and where the issues have been addressed in the EIS. Feedback from government agencies, including the Inner West Council have been addressed in Table 7-8 and 7-9 in the EIS.

Release of information and data which may influence commercial matters is contrary to the public interest for commercial and legal reasons. Examples of where the public interest matters against disclosure are contained within section (14) of Part 2 of the *Government Information (Public Access) Act 2009* (NSW).

Consultation materials were available to all members of the public, including communities of western Sydney.

Meetings with the Minister for WestConnex, The Hon. Stuart Ayres, are outside the scope of the EIS.

Quality and comprehensiveness of communication tools and materials

Project communication tools and materials were prepared by community consultation personnel, who were supported by technical specialists and consultants involved in preparing the EIS for the project. This meant that communication tools and materials included technical information about the project, were written and presented in plain English, and included diagrams and maps, where needed, to make the information more accessible. These materials were prepared to supplement the EIS, providing assistance and guidance to navigate the technical information included within the report.

Communication tools and materials, including factsheets, posters and project animations, were prepared by qualified professionals and were subject to quality control reviews prior to publication.

Television advertising for WestConnex is outside the scope of the EIS.

The graphical information for the project presented in the EIS is based on a concept design. While the layout of operational infrastructure and construction ancillary facilities (refer to Chapter 5 (Project description) and Chapter 6 (Construction work) of the EIS) may be subject to some refinement during detailed design, the information presented in the EIS depicts a feasible and workable solution for the project.

The needs of key stakeholder and community audiences have been carefully considered in the development of all M4-M5 Link public communication materials.

In general, the public communication materials included:

- Information about project activities and locations
- Information on key impacts and benefits associated with the M4-M5 Link
- Clearly labelled maps, photographs and artists' impressions
- Information about how to contact the M4-M5 Link team to find out more information
- Information on how to access translating and interpreting services.

The most current information about the project is available on the WestConnex website[1].

Regard for particular sectors of the community

A detailed stakeholder analysis was undertaken to identify sectors of the community, including local residents and businesses, for consultation and engagement. The following groups were identified:

- Government – including local, State and Commonwealth representatives and officers
- Local Aboriginal stakeholders
- Interest groups – including industry, business, community groups, pedestrian and bicycle user groups
- Residents and businesses within and near the project footprint
- Utilities and service providers – including water, gas, electricity and telecommunications
- The broader community – including potential future users of the project.

Should the project be approved, future consultation will be carried out with regard to construction activities, including construction access management and the management of impacts in accordance with the environmental management measures in **Chapter E1** (Environmental management measures) and the conditions of approval.

On 12 May 2016, the NSW Government announced reforms to local government, which saw the amalgamation of local councils to form new councils. The consultation program for the project was also influenced by these changes to local government structure. Leichhardt, Ashfield and Marrickville were amalgamated to form the Inner West Council and meetings with Inner West Council have been held regularly since the amalgamation in May 2016. Prior to the council amalgamation, meetings were held with the former Leichhardt, Ashfield and Marrickville councils.

Genuine engagement

Roads and Maritime and SMC have sought to provide genuine engagement prior to (in relation to the WestConnex program of works) and during development of the M4-M5 Link project design and EIS. Engagement with the community began in January 2016, very early in the design and assessment process, allowing adequate time for consultation prior to making design decisions.

The SEARs require thorough and genuine assessment of all impacts of the proposed project. Table 7-1 of the EIS outlines SEARs relevant to consultation and where in the EIS these have been addressed, demonstrating that the consultation for the EIS meets the SEARs for the project.

The internal government policy of directing specific queries and concerns to the relevant government minister, in this case the Minister for WestConnex, is believed to be sufficient in order to adequately address any concerns made. Should the concern require the Premier's specific response it would be escalated as required following internal government policy.

Consideration of the project against a range of strategic alternatives to identify the extent to which they could meet the project objectives is discussed in section 3.3 of the EIS and **Chapter C4** (Project development and alternatives).

The request for investigations into the community consultation to be conducted is beyond the scope of the EIS for the project and is a matter for the NSW Government.

Responsiveness to queries and issues

Following the NSW Government's announcement on 21 July 2016 regarding the Rozelle interchange, a comprehensive community engagement process was carried out, with a focus on identifying new ideas and understanding community needs and values in relation to the project. The feedback from consultation activities was collated and published on the WestConnex website in a community feedback report (November 2016).

In May 2017 the M4-M5 Link concept design was released for community consultation, which is not a statutory requirement. The concept design was open for comment from the community for a period of 12 weeks, as requested by the community. Subsequently in August 2017 the feedback report summarising the submissions made by the community was finalised and made available on the WestConnex website.

[1] www.westconnex.com.au

Community feedback has been considered during the planning, design development and environmental assessment for the project. Table 7-2 of the EIS outlines how feedback from stakeholders and the community was used to influence design outcomes and avoid impacts. Table 7-10 of the EIS provides a summary of feedback received up until August 2017 from the community, community groups, businesses and adjoining and affected landowners, during the preparation of the EIS. The feedback in the table is consolidated for the purpose of the EIS and provides a response or indicates where in the EIS the topic has been addressed.

Concerns raised by the City of Sydney are discussed in **Chapter B10**. The Inner West Council's concerns are presented in **Chapter B11** and **Chapter B12**.

SMC provided a response on 18 August 2017 to the independent report concerning the Darley Road civil and tunnel site (C4) provided by Inner West Council.

Transparency of project and design decisions

Roads and Maritime has sought to provide transparency around project design and development. Consultation activities such as the Community Ideas Sessions in July-August 2016 and the release of the Concept design report, provided insight into the project design and opportunities for the community to engage with the design development process. Table 7-2 of the EIS demonstrates how the feedback received from the community and other key stakeholders influenced the design development process.

The preceding stages of the WestConnex program of works have been based on a preferred tenderer design, leading to the community feeling that there was little opportunity for meaningful input. This feedback has led to the M4-M5 Link stage of the project following a different process, where the EIS is based on a comprehensive concept design. This method allows flexibility in making improvements to the design based on community feedback. Design improvements prompted by community feedback to date have included removing the Camperdown ramps; not using Easton Park, Blackmore Oval or Derbyshire Road as construction sites; change in traffic management in Rozelle (removal of cul-de-sac on Toelle, Callan and Springside Streets); a proposed truck marshalling area and inclusion of a Utilities Co-ordinator.

The project would be subject to detailed design and construction planning to be undertaken by the successful design and construction contractor(s). However, the design developed by the design and construction contractor(s) would need to be consistent with the project as described in the EIS, any environmental management measures, changes identified in a Submissions and preferred infrastructure report, the conditions of approval for the project and other requirements identified during the assessment of the project. Issues raised during public consultation on the EIS or in the assessment of the project by the DP&E would also be taken into account during the detailed design process, including during preparation of the Construction Environmental Management Plan (CEMP) and associated sub-plans.

Alternative locations for construction ancillary facilities are described in section 4.6.2 of the EIS. The rationale for excluding sites from the project is provided in Table 4-7 of the EIS. Blackmore Park and Easton Park were identified through community feedback as being important open spaces for the community. This, together with other technical and environmental factors, was considered during the site selection.

Community consultation undertaken during preparation of the concept design and EIS for the project raised the possibility of extending the Iron Cove Link further to the north, to the southern side of the Gladesville Bridge at Drummoyne (refer to section 4.5.3 of the EIS). This possible extension was not considered further as part of the M4-M5 Link project, as it:

- Could not be delivered within the project budget
- Is not currently identified as a policy priority of the NSW Government
- Would likely require additional property acquisition
- Would require further investigation, including a cost/benefit analysis.

Many of the reasons which led to an extension to the Gladesville Bridge not being further considered as part of the project would also be applicable for a tunnel which extended to Huntleys Point, given its proximity to the Gladesville Bridge and likely similar construction methodology. Although the option of a tunnel to Huntleys Point is outside the scope of the M4-M5 Link project, the development of the Iron Cove Link as part of the project does not preclude a further tunnel connection to the north at some stage in the future.

Support for the consultation process is noted.

C7.2 Consultation during EIS exhibition

1,868 submitters have raised issues regarding the level and quality of community consultation undertaken during exhibition of the EIS. Refer to section 7.6 of the EIS for a description of the EIS consultation process. Appendix G (Draft Community Consultation Framework) of the EIS provides further details on the approach to community consultation for the project.

C7.2.1 Level and quality of consultation during exhibition

Submitters raised concern that the level of quality of the consultation while the EIS was on public exhibition was not adequate. Specific concerns included:

- General concern that the community consultation was not conducted appropriately, specifically:
  - The process for community consultation is designed to stop the community from understanding the true impacts of the project as presented in the EIS
  - Engagement during exhibition of the EIS was not genuine and does not satisfy SEARs requirements
  - The community cannot provide adequate feedback because the project is based on a concept design, the impacts of the project are therefore unknown and the design and construction contractor(s) can make further changes later in the process
  - The adequacy of notification and amount of consultation with directly affected residents during the EIS exhibition
  - Information was withheld or hidden from the public during the consultation process
  - Inadequate consultation regarding the sale of SMC
  - Phone lines were not staffed adequately and staff did not return calls
  - Discrepancies and inaccuracies between sources of project information including the WestConnex website and the EIS
  - Information in the EIS
  - Concerns raised by the community and other stakeholders have not been considered
- Community consultation sessions:
  - Concerned that there has never been an adequately staffed consultation team
  - Some topics were beyond the expertise of respondents and as such there was a failure to respond to technical queries and provision of non-specific responses and approximations. In particular, no technical specialists or engineers were available at the EIS sessions to discuss tunnel design
  - Consultation was inadequate with inconsistent or misleading information
  - Roads and Maritime has stated at EIS sessions that there will be a review of the government's policy on unfiltered stacks but no information was provided about this review process
  - 3D architectural models of the interchange sites were not provided during the EIS community consultation sessions
  - Design initiatives were shared at public consultations that were not included in the EIS
  - WestConnex Action Group concerns were not adequately addressed in consultation sessions
  - SMC meetings at Rozelle Public School were cancelled with no explanation
  - Notification of community consultation sessions was inadequate

- Exhibition period timing:
  - The EIS submission period was over school holidays and was not an adequate length (60 days) to enable the community to be informed and participate
- The inability to comment on the following aspects of the project:
  - Construction Traffic and Access Management Plan
  - A UDLP
  - Out-of-hours work protocol
  - The Darley Road motorway operations complex due to lack of details on parking, safety, noise and amenity
- Responsiveness to submissions and a receipt which states that their submission was received and acknowledged
- Consultation should be undertaken with residents impacted by the M4 East and New M5 construction to realise the extent of impacts to residents.

Response

Conducting of the community consultation activities

Roads and Maritime and SMC have sought to provide genuine engagement prior to (in relation to the WestConnex program of works) and during development of the M4-M5 Link project design and EIS. Engagement with the community began in January 2016, very early in the design and assessment process, allowing adequate time for consultation prior to making design decisions.

During the public exhibition of the EIS a variety of consultation activities were undertaken to raise awareness of the exhibition period and ability to make a submission, inform community members how to make a submission and respond to queries. The consultation activities undertaken during exhibition of the EIS are summarised in **section A2.3** and included community information sessions, a series of briefings and meetings, and distribution of a range of information materials. The EIS was available to view and download on the DP&E Major Projects website and hardcopies available to the public at 19 locations across the communities affected. Five community drop-in sessions and briefings were provided as well as a number of meetings with key stakeholders and community members.

The SEARs require thorough and genuine assessment of all impacts of the proposed project. Table 7-1 of the EIS outlines SEARs relevant to consultation and where in the EIS these have been addressed and as such, the consultation for the EIS meets the SEARs for the project.

The M4-M5 Link EIS is based on a concept design rather than a detailed design, unlike the process adopted for the M4 East and New M5 projects. This means that the concept of the design and construction approach presented in the EIS is subject to detailed design and construction planning to be undertaken by a successful design and construction contractor(s). Community and agency feedback during the EIS exhibitions of the M4 East and New M5 projects indicated a desire for more community input into the design of the projects. As such, a different approach was adopted for the M4-M5 link project. It is common practice for an EIS to be based on a concept design.

Projects such as M4 East and New M5 were exceptions. Sometimes the specific details of a project are not known prior to detailed design and construction planning. Design refinements and possible amendments to the project information presented in the EIS and/or discussed with the community at information sessions, will be ongoing during detailed design. Consultation during the detailed design phase of the project will be ongoing, to ensure that the community is informed and given the opportunity to provide feedback. Further information on future consultation activities for the project is provided in **section A2.5**.

A mixture of communication methods were utilised to inform interested individuals about the EIS exhibition period, including:

- Media announcements on television, radio, print and digital news outlets
- Distribution of a community update to residents near the project footprint
- Direct emails to registered stakeholders
- Newspaper advertisements encouraging participation in community ideas sessions
- Website updates and social media.

The project phone line was staffed Monday to Friday between 8.30 am-5.00 pm. Any phone calls that were received outside of these hours were taken by a call centre service, with details of the caller/enquiry emailed to project personnel for follow-up. All phone calls were followed up.

The most current information available about the project has been available on the WestConnex website[2] and in publically available material. This information has been updated during the development of the concept design for the project.

Community consultation sessions

Multiple community and stakeholder consultation sessions were held for the M4-M5 Link project prior to and during preparation of the Concept design report and EIS, and throughout the submissions report process for the project. This included hosting sessions at Haberfield and Newtown, where communities currently being affected by the M4 East and New M5 construction works were able to provide feedback to the project team.

Community information sessions were held between 4.00 pm and 7.00 pm on weeknights, to allow people to attend after school pickups or work. Two Saturday (11.00 am to 2.00 pm) sessions were also held to accommodate community members who could not make sessions through the week. The community drop-in sessions were attended by a number of people from the EIS team, including technical specialists, as well as subject matter experts from Roads and Maritime. The team was on hand to provide information on the project and the identified impacts and benefits and to answer any questions. Other available information included posters, videos, copies of the EIS and a number of take away fact sheets covering technical topics as well as instructions on how to make a submission on the EIS. Attendees were encouraged to formalise their feedback and queries at these sessions by lodging a submission.

During the exhibition period, Roads and Maritime and SMC also attended a number of meetings (on request) with community interest groups to discuss specific issues raised in the EIS. This included meetings with Rozelle Public School parents, Haberfield Public School and the Coalition of Glebe Groups (COGG). Consultation with directly impacted land owners and residents is outlined in section 7.3.6 of the EIS. Dates of briefings/meetings with stakeholders and community groups are provided in **Table A2-5**. Two meetings were held at Rozelle Public School on 11 August and 20 September 2017.

The NSW Government routinely reviews international best practice on tunnel ventilation systems, however, Roads and Maritime is not aware of any specific government policy review on filtration. The NSW Government Advisory Committee on Tunnel Air Quality (ACTAQ) technical paper on the approach to ventilation systems (TP04: Road Tunnel Ventilation Systems Roads and Maritime 2014) can be found on the Chief Scientist's website[3].

Comments on technical aspects of the project

A Construction Traffic and Access Management Plan (CTAMP) will be prepared as part of the CEMP and will be made publicly available. This will be prepared in keeping with the environmental management measures detailed in **Chapter E1** (Environmental management measures). The CTAMP will be prepared in consultation with relevant transport stakeholders and local councils.

[2] www.westconnex.com.au
[3] http://www.chiefscientist.nsw.gov.au/reports/advisory-committee-on-tunnel-air-quality

Details regarding the Darley Road motorway operations complex (MOC1) are discussed in the following sections:

- Parking is discussed in **section C8.23.1**
- A range of safety measures applicable to the project including the Darley Road motorway operations complex are presented in the environmental management measures in **Chapter E1** (Environmental management measures)
- Noise:
  - Traffic noise is discussed in sections C10.11.1 and C10.14.3
  - Operational noise is discussed in section C10.12.1
- Amenity:
  - Land use changes is discussed in section C12.8.2
  - Pedestrian and cyclist connectivity in section C13.12.1.

The UDLPs for the project would be prepared based on the detailed design and in accordance with relevant commitments in the EIS. The UDLPs would be prepared in consultation with relevant councils, stakeholders and the community. The community and stakeholders will be able to comment on the draft UDLPs during an exhibition period and the feedback will be considered in the final UDLPs.

An out-of-hours work protocol would be developed as part of the project-wide Construction Noise and Vibration Management Plan (CNVMP) and is expected to form a requirement of the project's Environment Protection Licence. A copy of the out-of-hours protocol would be available for public access.

Exhibition duration

Under the EP&A Act, the Secretary of DP&E is responsible for determining the timing and duration of public exhibition periods for EISs. For the project, the Secretary of DP&E determined to extend the public exhibition period from the statutory minimum of 30 (calendar) days to a total of 60 (calendar) days (18 August to 16 October 2017). This was due to school holidays and the length and complexity of the EIS documentation.

Other concerns

Further detail regarding the sale of SMC is detailed in **Chapter C1** (Project governance) of this report.

This Submissions and preferred infrastructure report has been made publicly available on the DP&E Major Projects website[4].

C7.2.2 Access to EIS documents and related information

Submitters raised concerns that EIS documents were not readily accessible. Specific concerns included:

- Restricted access to the EIS due to limited copies and opening hours in libraries
- The EIS is inaccessible for people with disabilities, loss of memory, who are elderly or who have English as their second language. It also required submitters to have access to a personal computer and internet connection, be computer literate and have good eyesight
- The EIS was not provided in a large format in libraries and other centres
- The EIS fails to adhere to the Web Content Accessibility Guidelines
- A significant portion of the EIS (Chapters 9-15 including the air quality assessment in the large file section) was withheld from the DP&E Major Projects website until rectified 25 September. Based on this the community should have been given more time to review
- The EIS was not displayed at St Peters
- Geotechnical data was 'commercial in confidence' and not made available to residents.

[4] http://majorprojects.planning.nsw.gov.au/

Response

Accessibility of the EIS was taken into consideration when preparing the document for public exhibition. The EIS was made available in electronic copy via the DP&E Major Projects website[5] and was therefore accessible 24 hours per day, seven day per week. The EIS could also be viewed online from any Services NSW Centre.

The electronic copy of the EIS complied with accessibility requirements as per the Web Content Accessibility Guidelines (WCAG) 2.0. Hard copies of the EIS were made available at 19 locations across 16 suburbs of Sydney including local libraries and council customer service centres, for those without computer or internet access. The full EIS including technical reports was available during the entire exhibition period on the DP&E Major Projects website. The DP&E Major Projects website is the responsibility of DP&E. Roads and Maritime also provides a translating and interpreting service for people who required project information in other major languages. A phone number and email address were also provided for community members to contact SMC and Roads and Maritime with specific questions.

The EIS was displayed at St Peters Library, as well as libraries in nearby areas including Marrickville Library, Newtown Library, Stanmore Library and Ultimo Library (refer to **section A2.3.1** for the full list of locations where the EIS was displayed).

Release of detailed geotechnical data at the time of the EIS was contrary to the public interest for commercial and legal reasons. Project information has been publicly disclosed by Roads and Maritime in accordance with the *Government Information (Public Access) Act 2009* (NSW).

C7.2.3 Size/readability of the EIS

Submitters commented that the size and readability of the EIS, the use of technical language, its length and complexity made it difficult to read, understand and find relevant information. Specific concerns included:

- Information in the EIS was deliberately obscure and hard to interpret
- The length and inaccessibility of the EIS prevented members of the public to understand and comment on the content in the required timeframe
- The general public, who are not experts in planning proposals and impacts statements, found it difficult to interpret the document and therefore the impacts have not been adequately explained
- Communication materials (including pamphlets) were complex and hard for the general public to interpret
- Coding system for the construction sites has no reference to geographical location and makes it confusing for the reader
- People who speak English as a second language found it difficult to understand the EIS. A submitter noted that they had not seen any evidence to provide material in languages other than English
- Particular concerns regarding figures and maps in the EIS included:
  - Maps depicting the tunnel route are confusing, difficult to interpret and find the actual location of the WestConnex roads and the convention for identifying directions in Figure 1-3 of the EIS is confusing
  - Placement of portal locations on maps does not match the actual portal locations,
  - Misleading information on the online maps, which show a single 'fan' icon only in Rozelle Rail Yards creating the impression there is only a single ventilation outlet in Rozelle Rail Yards compared to the large portable document format (PDF) maps show three stacks
  - Diagrams of the exhaust ventilation tunnels were hidden in an unrelated section of the EIS
  - Maps and analysis of pollution effects in the EIS were not presented in a way that residents could understand.

[5] http://majorprojects.planning.nsw.gov.au/

Response

The EIS has been prepared by a team of qualified professionals and presents a balanced merit-based environmental impact assessment in accordance with the EP&A Act, the SEARs and applicable NSW assessment policies. This required various detailed investigations and technical specialist studies to be completed to assess the potential environmental impacts of the M4-M5 Link. While the technical working papers and other supporting documents appended to the EIS are by their nature technical documents, the main EIS chapters have been simplified and written in plain English as far as is possible, while still conveying the outcomes of the technical assessments undertaken. Due to the scale and complex nature of the M4-M5 Link project, this has in some cases resulted in large EIS chapters and technical documents.

The EIS includes an executive summary that provides an overview of the key impacts/benefits and management and mitigation measures. Appendix A (Project synthesis) of the EIS provides a technical summary of the EIS and overview of key impacts and mitigation measures, as required by the SEARs. In addition, a community guide to the EIS was also developed, which provided a high-level, plain English overview of the project and reference to where the community could find detailed information within the EIS. Fact sheets were also made available on the WestConnex website that captured key issues and impacts from the EIS.

Roads and Maritime has endeavoured to use less technical terms and jargon and more common language in the EIS, where possible. The document has been reviewed by technical editors and communications personal with the intent of making the document readable for the general public. The consultation process for this project has been aimed at creating an open dialogue through many mediums (community information sessions, email, mail, social media, and door to door visits) to ensure that the EIS is communicated on a level that everyone is able to participate on.

Roads and Maritime also provides a Translating and Interpreting Service for people who require project information in other major languages. WestConnex communication materials, including the project website, are available in seven languages and translation services are also available through the Translating and Interpreting Service. A community relations support toll-free telephone line was also operated to respond to any community concerns or requests for translation services.

A naming convention for the construction sites (C1 to C11) has been used to simplify and improve readability of the EIS. The construction sites were defined in each chapter of the EIS and technical reports. Figure 6-14 to Figure 6-25 in Chapter 6 (Construction work) of the EIS provides an indicative site layout which shows the geographical location of each of the sites.

Diagrams and maps

The EIS aimed to provide clearly labelled maps and diagrams to assist in making the information presented more accessible using designs which are consistent with the style used in other WestConnex communications, including the Concept design report. Ventilation outlets were labelled, where applicable, on figures throughout the report, including throughout Chapter 5 (Project description), including Figures 5-1 to 5-9.

The reason for the use of the convention for identifying directions of travel in the EIS (ie northbound/southbound) is required for clarity and consistency and is described in section 1.5 of the EIS and shown in Figure 1-3.

C7.2.4 Process for submitting a comment

A submitter complained that the online process for making a submission was confusing. They have suggested a single word security code be used with an acknowledgement email sent to submitters.

Response

The use of a security code is standard practice when submitting forms online and is required for security reasons. Comments on the EIS were submitted via the DP&E Major Projects website[6]. Since the exhibition of the EIS, the DP&E Major Projects website has been updated to use 'tick-box' security codes rather than words, thereby making it easier for community members and other stakeholders to submit their comments. The DP&E Major Projects website and process for submitting comments is the responsibility of DP&E.

[6] http://majorprojects.planning.nsw.gov.au/

C7.3 Future consultation

2,767 submitters have raised issues regarding the consultation that would be undertaken during detailed design and construction. Refer to section 7.6 of the EIS for a description of the consultation process following exhibition of the EIS. Appendix G (Draft Community Consultation Framework) of the EIS provides further details on the approach to community consultation for the project.

C7.3.1 Future consultation during construction

Submitters requested ongoing consultation and transparent provision of information to local councils, interest groups and residents. Further consultation was also requested on particular topics including dust issues during construction. Specific issues included:

- Engagement with the design and construction contractor(s):
  - Councils and the public will have no right to information or feedback after the construction consortium is chosen and that is when the risks will be properly identified including health, environment and safety along with finalised project designs and construction methodologies
  - Concern that residents will have no opportunity to comment on the impact of construction facilities that are identified by the design and construction contractor(s) after the EIS approval. A submitter notes that the EIS states that the design and construction contractor(s) may decide upon additional construction ancillary facilities in addition to the 12 identified in the EIS and in particular at the Rozelle Rail Yards site and The Crescent civil site
  - Concern that daytime noise at 177 properties across the project is predicted to exceed noise criteria over extended periods resulting in additional noise treatments. However these properties may change as the design changes without the public being specifically notified or given the chance for feedback. This means that there is a possibility of hundreds of residents being severely impacted who were not identified in this EIS
  - Tunnel excavation methods would not be confirmed until the design and construction contractor(s) has been awarded
  - An coordinated complaints system, independent of the design and construction contractor(s) should be established
  - The sale of SMC would result in the eventual design and construction contractor(s) not being bound to take community feedback into account
  - Request consultation with affected residents regarding future road closures at Leichardt
  - Once construction contracts have been issued the community will have no say or control over methodology to be used to remove contaminated spoil and other construction methods with specific request for the following items as part of the conditions of approval:
    - A local project liaison officer be present at each construction site
    - Implementation of improved complaints mechanisms
    - Implementation of improved consultation for hearing and vision impaired, socially isolated and non-English speaking people
    - Implementation of improved liaison with tenants
    - Hardboard and illuminated pedestrian notices communicating detours, road changes and bus stop closures/relocations be installed
    - All project, utility and associated work notices, letters, notifications go onto a community noticeboard as well as a website
    - Up-to-date project community noticeboards are created and maintained at each construction site and also at central areas such as shopping centres and libraries
    - Inclusion of the ability for the community to raise complaints during construction on the CTAMP in addition to the requirement for key stakeholders and councils to be involved in its development

- The project is based on a concept design with many unknowns. Specific questions raised include:
  - What is being done below their residences, schools, business premises, public building and public spaces (particularly if the project is sold to a private corporation, before the detail design and construction plans are determined)?
  - What standards the project is supposed to comply with?
  - What inspection or scrutiny it will subject to?
  - Whether the private corporations undertaking the work will be held to any liability by our government?
  - The EIS makes references to the detailed design and construction plans being reviewed but there is no information as to whether the outcomes of such reviews will be made public
- Consultation regarding changes during detailed design:
  - Ongoing consultation on changes to detailed plans and construction methodologies for specific area
  - Concern that construction site layouts and access arrangements in the EIS are not confirmed and any changes do not allow for community input
  - Future consultation is requested regarding management of ventilation outlets and adjoining buildings. The final plan should be released to the public
  - The projects design is 'indicative', the public would have no input if the route and design changed. Suggests a process should be put in place where Rozelle Public School community are notified of any changes affecting the school
  - Request for a revised approach to community consultation for the M4-M5 as the reliance on electronic is inadequate
- Future detailed management plans:
  - Genuine consultation about the traffic and access management plan is requested
  - Requests for the community and local council to have representation on Urban Design Review Panel
  - Concern about no provision of environmental management plans in the EIS and request for future consultation for those plans after preparation
  - Concerns that the community will not have an opportunity to make comments on the out-of-hours work protocol or the management of impacts
  - Concern the community will have no opportunity to influence of the management plans yet to be developed
  - Concern on how the contaminated dust at Rozelle Rail Yards during construction will be securely managed and whether the community would be consulted
  - Noise and vibration management plan should be released for public consultation to identify the affected residences and what mitigation measures will be applied
- Future consultation with commercial stakeholders should include advance notice of:
  - Surface level roadworks
  - Particulars and timing of construction works on major roads or near major roads that may affect trade at retail outlets
  - Advanced notice of works with potential to affect passing traffic flows to commercial sites, and requests to be invited to participate in the preparation of construction-related management plans
  - The proponents should be required to seek concurrence from potentially sensitive receivers before any tunnelling design and construct contracts are finalised in the vicinity of commercial sites to minimise the risks of environmental harm

- A Utility Co-ordination Committee be established and managed by an independent body, with the terms of reference made available to the public
- A body representing local, state and federal interests should be formed to enforce improvements onto the project proponents as well as design and construction contractor(s)
- Regular and comprehensive information and notifications should be published by WestConnex in the event that air pollution, noise and vibration levels and other conditions are raised to unsafe levels
- Objection to the section on Appendix A, Volume 2A Future consultations as it seems like it has been copy-pasted and does not reflect the current M4-M5 Link EIS consultation process
- Objection to the EIS because the proponent/contractor would only have to keep local residents, businesses and the NSW Environment Protection Authority (EPA) informed about works outside standard daytime construction hours at the site
- A call centre should be set up to respond to ongoing public queries about the project.

Response

As outlined in **section A2.5**, SMC and Roads and Maritime would continue to consult with the community and other key stakeholders during the ongoing refinement of the design, with a view to further minimising impacts of the project on communities. The community and other key stakeholders will also be involved in consultation on the UDLPs and Social Infrastructure Plan.

In accordance with section 115Z(6) of the EP&A Act, a preferred infrastructure report has been prepared for the project (see **Part D** (Preferred infrastructure report)). The preferred infrastructure report explains changes or refinements that have been identified to minimise environmental impacts or to address issues raised during exhibition of the EIS.

As described in section 6.5.1 of the EIS, twelve construction ancillary facilities have been described and assessed in the EIS. The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design and would be generally consistent with the EIS and the Submissions and preferred infrastructure report and satisfy criteria identified in any relevant conditions of approval. Further, additional ancillary facilities may be proposed by the contractor, once engaged. Prior to the establishment of ancillary facilities that are not identified in this EIS, the contractor would need to satisfy any relevant conditions of approval.

Additional sites may be subject to separate environmental assessment and approval, subject to the extent of environmental and social impacts. If further approval is required due to project design changes, the applicable statutory process will be followed prior to commencement of construction or operation of the relevant aspect of the project. This may be in the form of a modification to the Instrument of Approval under section 115Z1 of the EP&A Act, depending on the scale of the proposed modification and the potential for environmental or social impacts.

The CEMP and associated sub-plans for the project will be prepared to be consistent with the environmental management measures detailed in **Chapter E1** (Environmental management measures). The plans, including the CTAMP, will be developed in consultation with relevant stakeholders including councils.

Should the project be approved, the proponent would be required to establish an Urban Design Review Panel (UDRP) to provide advice and guidance during detailed design and preparation of UDLPs. The UDRP would advise in relation to architecture, heritage values, urban and landscape design and artistic aspects of the project. The composition of the panel would be subject to the conditions of approval from DP&E, however this would likely include representatives from local councils to represent the local government area (LGA) and its constituents.

During construction, a dedicated community relations team will deliver:

- A detailed Community Communication Strategy (identifying relevant stakeholders, procedures for distributing information and receiving/responding to feedback, and procedures for resolving stakeholder and community complaints during construction and operation)
- Notification letters and phone calls to residents and businesses directly affected by construction works, changes to traffic arrangements and out-of-hours works
- Face-to-face meetings with landowners as needed

- Regular community updates on the progress of the construction program
- Regular updates to the WestConnex website
- Media releases and project advertising in local and metropolitan English language and non-English language newspapers to provide contact information for the project team
- Site signage around construction ancillary facilities
- 24-hour, toll-free project information and complaints line, a dedicated email address and postal address.

Further information regarding future consultation for the project is provided in **section A2.5**.

C7.3.2 Notification of tunnelling activities

Submitters requested residents above the tunnel be notified when tunnel boring is about to commence below their property including start date and time. Specific concerns included:

- The proponent should be required to consult with and seek agreement with the operators of retail fuel outlets before any tunnelling works in the vicinity of retail fuel outlets to minimise the risks of environmental harm associated with underground fuel storage tanks
- More direct consultation should be undertaken prior to night-time tunnelling works - this should be included as management measure.

Response

The design and construction contractor(s) will provide notification to adjoining and potentially impacted properties of upcoming construction activities, including tunnelling, in accordance with the Community Communication Strategy and the Environment Protection Licence and other conditions of approval. These notifications will be provided to groups of residences and relevant stakeholders and would advise approximate start and end dates for tunnelling under a specific group of properties, including approximate timeframes for tunnelling. Consultation with commercial businesses, including retail fuel outlets, will be undertaken in accordance with a Community Communication Strategy.

A tunnelling tool, similar to the one developed for the M4 East and New M5 projects, will also be made available to the public[7]. This tool will allow residents to see the tunnel alignment, the depth of the tunnel below a property and track the progress of road headers.

C7.3.3 Consultation regarding the open space at the Rozelle Rail Yards

Submitters raised concerns about the final open space arrangements for the Rozelle Rail Yards. Specifically, in reference to the final design not being included in the EIS and concern that the project is going ahead without community consultation on the design.

Response

A community engagement process followed the announcement of the former Rozelle Rail Yards as new open space for local communities, with a focus on identifying new ideas and understanding community needs and values in relation to the project. The feedback from consultation activities was collated and published on the WestConnex website in a community feedback report. This report has been considered during the planning, design development and EIS for the M4-M5 Link project.

A concept design for the Rozelle interchange works has been prepared, and was included in Appendix L (Technical working paper: Urban design) of the EIS. Relevant information was also provided in Chapter 12 (Land use and property) and Chapter 13 (Urban design and visual amenity) of the EIS.

[7] https://www.westconnex.com.au/tunnelling

The concept design will be refined during the development of UDLPs for the project, which will be prepared based on a detailed design for the project and in accordance with relevant commitments in the EIS, the updated environmental management measures in **Chapter E1** (Environmental management measures) and any relevant conditions of approval. The UDLPs will be prepared in consultation with relevant councils, stakeholders and the community and with consideration of council and state planning documents, including a recreational needs analysis and strategic policies such as *The Bays Precinct Transformation Plan* and design principles of the Interpretation Strategy. The UDLPs will be publicly accessible documents.

C7.3.4 Future consultation with key stakeholders and interest groups

Submitters requested further consultation with stakeholder groups.

- Request for consultation with Rozelle Public School. Specific requests made by the school representatives and parents were:
  - For mandatory consultation about the works that are proposed to proceed at Rozelle and or Lilyfield
  - More detailed visual designs to be provided to parents for their comment
  - More detailed plans on construction around their school to be provided to parents and for community input prior to any changes being made
  - Representation on any potential Urban Design Panels
  - Results of requested air quality monitoring at Rozelle Public School to be made public
- Consultation should include Sydney Metro and UrbanGrowth NSW to achieve an efficient whole of government approach. Further consultation with user groups, local and state authorities on refining the overall active transport strategy
- The Civil Aviation Safety Authority (CASA) should be consulted and their input on aviation safety be considered in the decision-making process for the project
- Consultation with bicycle user groups including Australian Cycle Alliance, Bicycle NSW and Bicycle Network
- Requests for consultation with Sydney Water to demonstrate that construction of the M4-M5 Link tunnels would have negligible adverse settlement or vibration impacts on Sydney water assets
- Requests for consultation with the Haberfield Association and other relevant stakeholders about the cumulative impacts of WestConnex projects upon the Yasmar Estate and House, prior to approval of the application
- Request for further consultation with technical experts regarding environmental impacts
- Consultation to address concerns that key interest groups and affected residents will have limited say in the management of impacts or deficiencies in the EIS.

Response

As outlined in **section A2.5**, SMC and Roads and Maritime will continue to provide consultation opportunities for the community and other stakeholders including Rozelle Public School and the Haberfield Association during the ongoing refinement of the design and during construction. Consultation will be carried out with a view of further minimising impacts of the project on communities. The community and other key stakeholders will also be involved in consultation regarding the UDLPs for the project.

In addition, a number of the environmental management measures identified in the EIS would require further consultation with the community and project stakeholders. These are summarised in **Chapter E1** (Environmental management measures).

Should the project be approved, the proponent will be required to establish an UDRP to provide advice and guidance during detailed design and preparation of the UDLPs. The composition of the panel would be subject to the conditions of approval from DP&E; however this would likely include representatives from local councils to represent the LGA and its constituents. Consultation with relevant stakeholders will continue throughout detailed design and construction including UrbanGrowth NSW and Transport for NSW (regarding Sydney Metro).

Community and stakeholders including CASA, Australian Cycle Alliance, Bicycle NSW and Bicycle Network will be consulted with throughout the detailed design and construction planning stage, as required. Consultation with Sydney Water is discussed in **section B4.4**.

DP&E commissioned independent technical peer reviews of key technical studies presented in the EIS to inform its assessment of the project, including review by ACTAQ. Further consultation with technical experts regarding the assessment of environmental impacts is not required.

Technical assessments included an analysis of current and historical land uses in the area, to identify potential contamination impacts (refer to Chapter 16 (Contamination) of the EIS). This included the identification of potential underground service tanks present within or near the project. Environmental management measures will be implemented to minimise the risks of contamination impacts from fuel tanks (see **Chapter E1** (Environmental management measures)).

As outlined in Appendix F (Utilities Management Strategy) of the EIS, a Utility Co-ordination Committee would be established to coordinate concurrent works associated with multiple overlapping projects and individual utility works to manage potential cumulative impacts and ensure that appropriate respite is provided for potentially affected residents and other sensitive receivers. The Utility Co-ordination Committee would comprise representatives from the relevant local councils, utility service providers and other major infrastructure projects occurring in proximity to the project. The implementation of the Utilities Management Strategy is environmental management measure PL14 (see **Chapter E1** (Environmental management measures)).

C7.3.5 Future consultation on the preferred infrastructure report and detailed design

Submitters raised concern that they would not be given the opportunity to comment on the preferred infrastructure report or the subsequent detailed design. The following specific concerns were raised in relation to the preferred infrastructure report:

- The M4-M5 Link EIS should not be assessed, approved or tendered until the preferred infrastructure report is publicly exhibited with an extended submission period to provide community feedback
- The community should have the opportunity to review and comment on specific impacts in the preferred infrastructure report
- The EIS should be reviewed, revised and resubmitted and re-exhibited in line with the preferred infrastructure report
- Consultation in mid-2018 is meaningless as it is post approval and post design
- New construction sites may be chosen which would impact residents and these have not been assessed in the EIS.

Submitters raised concern that the EIS is a concept design and is likely to be altered significantly during the detailed design stage. Concern that hundreds of risks associated with the project (including estimation of costs) have been deferred to the detailed design stage, in which the public will have no input into the final design, following the appointment of a design and construction contractor(s), approval conditions or management measures. Specifically the following concerns were raised:

- No opportunity to comment on:
  - The final choice of construction sites, including Options A and B civil site at Haberfield as they are conceptual and subject to change
  - The impact of construction facilities identified by the design and construction contractor(s) following approval of the EIS (particularly at Haberfield and Ashfield)
  - The CTAMP, AFMP and noise management plans. Particular concerns were raised for residents near Darley Road, the risk to children from construction traffic at Haberfield School and entitlement to noise mitigation
- The actual project design and methodologies are to be finalised after the design and construction contractor(s) are engaged and therefore the community is unable to comment on the real proposal. Particular concerns were raised for construction activities at the Rozelle Rail Yards and The Crescent civil site

- Request for community and local council representation on any design or UDLP panels including the final detailed design
- Request that the final tunnel alignment is made public and opportunity to provide feedback that will be acknowledged and adopted
- Request that the preferred infrastructure report be made public immediately after it is filed with the DP&E.

Response

In accordance with section 115Z(6) of the EP&A Act, a preferred infrastructure report has been prepared for the project (see **Part D** (Preferred infrastructure report)). This report explains changes or refinements that have been identified to minimise environmental impacts or to address issues raised during exhibition of the EIS. This Submissions and preferred infrastructure report has been made publicly available by DP&E on the DP&E Major Projects website[8]. Exhibition of the preferred infrastructure report for public comment is at the discretion of the NSW Minister for Planning.

Should the project be approved, the design presented by the appointed design and construction contractor(s) will need to satisfy all technical road design requirements and road functionality as described in the EIS and this Submissions and preferred infrastructure report, and to be consistent with the approved scope of the project, including the environmental management measures and conditions of approval for the project.

A change to the project design presented in the EIS may need to be assessed. If the proponent (Roads and Maritime) wishes to modify the project following approval they can apply to the NSW Minister for Planning. Any modification requests would be lodged with DP&E for assessment. The modification request would be appropriately notified and/or exhibited depending on the scale of the proposed modification and the potential for environmental or social impacts.

As outlined in **section A2.5**, SMC and Roads and Maritime will continue to consult with the community and other stakeholders during the ongoing refinement of the design and during construction, with a view to further minimising impacts of the project on communities. The community and other key stakeholders will also be involved in consultation on the UDLPs and Social Infrastructure Plan for the project. As noted in **section C7.3.1**, the composition of a UDRP panel would be subject to the conditions of approval from DP&E, however this would likely include representatives from local councils to represent the LGA and its constituents.

As described in section 6.5.1 of the EIS, 12 construction ancillary facilities have been described and assessed in the EIS, including five sites as Haberfield and Ashfield. The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design. Based on community feedback and concerns raised in submissions on the EIS, a number of refinements to the construction ancillary facilities at Haberfield and Ashfield have been made to further minimise impacts on the community and sensitive receivers. This includes:

- Wattle Street civil and tunnel site – the area at the surface is currently being used as a construction zone for the M4 East project and would no longer be used. Construction activities would be limited to the Wattle Street entry and exit ramps
- Haberfield civil site – footprint reduced and the site would be used as a civil site only as per the arrangement for the Haberfield civil site (C2b). The C2a option would therefore not be used for the construction of the project. No tunnelling from this site is proposed.

Further responses to construction planning at Haberfield and Ashfield are provided in **section C6.1.3**.

C7.3.6 Future consultation sessions requested

Submitters have requested further consultation with the community. Specific requests are for:

- Community meetings at Rozelle Public School, Haberfield Public School and in the Haberfield and Ashfield neighbourhood area
- A full public consultation and approval with the community of Tempe

[8] http://majorprojects.planning.nsw.gov.au/

- A meeting with the project team and other relevant parties to discuss industrial heritage buildings in Bignell Lane in regards to what existing structures, including buildings, will be demolished and the exact nature of the permanent realignment of Bignell Lane
- Consultation with Haberfield business owners to discuss how serious the impacts of construction traffic disruption and congestion can be
- DP&E approvals and assessment team run a series of workshops with residents after the release of the preferred infrastructure report which recommends that the EIS be reassessed and allow the public to provide feedback on a more considered design
- Future consultation with regards to air quality impacts occurs, including suggestion that this could include a video presentation
- Future consultation for people with disabilities to confirm access arrangements to public transport and commercial premises
- A meeting with key project experts to understand overall impacts to residents, children and properties
- As part of the conditions of approval, submitters requested:
  - Robust conditions of approval to utility works are presented to the community and stakeholders
  - That the DP&E hold neighbourhood group meetings to establish consultation between local residents and relevant construction employees
  - Regular, advertised weekly/monthly resident drop-in sessions with DP&E, SafeWork NSW, Roads and Maritime, Transport for NSW, Transport Management Centre, Sydney Local Health District, Primary Health Network, and technical people from the construction contractor team
- Request that an office be established at the Rozelle civil and tunnel site to address ongoing community concerns, without delay or a paper trail for upcoming issues.

Response

The responses to submissions made during the EIS exhibition period are provided in this Submissions and preferred infrastructure report. This report has been made publicly available by DP&E on the DP&E Major Projects website[9].

SMC and Roads and Maritime are committed to engage and consult with key stakeholders and community members throughout the project. As with the M4 East and New M5 projects, it is common practice for the design and construction contractor(s) to hold at least quarterly community drop-in sessions to provide updates about the project construction. Ongoing consultation activities that are proposed during construction are described in **section A2.5** with further responses regarding ongoing consultation provided in **section C7.3.4**.

As noted in **section C7.3.4**, during construction a dedicated community relations team will deliver:

- A detailed Community Communication Strategy (identifying relevant stakeholders, procedures for distributing information and receiving/responding to feedback, and procedures for resolving stakeholder and community complaints during construction and operation)
- Notification letters and phone calls to residents and businesses directly affected by construction works, changes to traffic arrangements and out-of-hours works
- Face-to-face meetings with landowners as needed
- Regular community updates on the progress of the construction program
- Regular updates to the WestConnex website
- Media releases and project advertising in local and metropolitan English language and non-English language newspapers to provide contact information for the project team
- Site signage around construction ancillary facilities

[9] http://majorprojects.planning.nsw.gov.au/

- 24-hour, toll-free project information and complaints line, a dedicated email address and postal address.

Conditions of approval are a matter for DP&E to consider during its assessment of the project. Recommendations for the NSW Premier and Ministers are beyond the scope of the EIS.

C8 Traffic and transport

This chapter addresses issues raised in community submissions associated with the traffic and transport assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 8 (Traffic and transport) and Appendix H (Technical working paper: Traffic and transport) of the EIS for further details on the traffic and transport assessment.

Contents

C8.1 Level and quality of the traffic assessment

311 submitters have raised issues regarding the level and quality of the traffic assessment undertaken (where it has not been specified if the concern relates to construction or operation). Refer to section 8.1 and Appendix H (Technical working paper: Traffic and transport) of the EIS for details of the assessment methodology.

C8.1.1 Level and quality of the traffic assessment (general)

Submitters raised concerns regarding the adequacy and quality of the traffic assessment, in which it was not clear if the submitter was concerned about the construction or operational traffic assessments. Specific concerns included:

- Request for traffic modelling to be independently assessed and audited, as there is doubt over the accuracy of the current models
- Accuracy of AECOM traffic modelling based on its history and its impacts on the costs and delays to the project
- As previous traffic predictions for road projects have been wrong, submitter does not believe that the traffic predictions for this project are accurate
- The EIS did not provide a statement regarding the level of accuracy and reliability of the traffic modelling process
- The traffic analysis provides a misleading and incorrect definition of ‘congestion’, hence impacting on the traffic assessment
- The traffic analysis fails to deal with the impacts of traffic beyond the boundaries of the project
- The EIS did not assess:
  - Risks of the project to public safety
  - Impacts to other road users, such as cyclists, pedestrians and users of public transport
- The traffic model lacks detail
- The traffic assessment has not adequately assessed the many design changes and land use forecasts
- Impacts are identified but are not seriously evaluated against the claimed benefits of the project. These include traffic disruption and congestion, street closures and traffic diversions
- The EIS does not identify existing or potential bicycle routes as required by the Secretary’s Environmental Assessment Requirements (SEARs)
- The cycleways are overstated/incorrect
  - Mullens Street and Montague Street in Balmain are listed as cycleways but they are some of the most cramped streets in Sydney and not cyclist friendly
  - Impossible links such those through private property eg Glebe Island Bridge is a listed route.
- The EIS uses a distance criteria to assess the impact of the existing walking and cycling routes that will need to be diverted as a result of the M4-M5 Link and does not consider the additional time it would take to complete the diverted route
- Traffic impacts in side streets off Victoria Road such as Toelle Street have not been adequately modelled.
- The EIS omits connectivity maps for Wattle Street and St Peters interchange but includes details for Rozelle and Iron Cove link
- EIS does not specify what traffic analysis is being carried out and by whom.

Response

The assessment of potential traffic and transport impacts of the project was undertaken using the WestConnex Road Traffic Model version 2.3 (WRTM v2.3), which was developed and operated by NSW Roads and Maritime Services (Roads and Maritime) at the outset of the WestConnex program of works. The WRTM v2.3 provides a platform to understand changes in future weekday travel patterns under different land use, transport infrastructure and pricing scenarios. Traffic demand data contained within the traffic and transport assessment in Appendix H (Technical working paper: Traffic and transport) of the EIS was taken from the WRTM, following assessment of the model calibration and validation by independent peer reviewers and their agreement that the model is suitable for this purpose.

The model also uses land use and population data and anticipated demographic changes to inform its forecasts. Although the WRTM v2.3 is a network-wide model that encompasses existing and future road networks in the Sydney metropolitan area, it was principally developed to assess infrastructure improvements associated with the WestConnex component projects individually and in combination. The modelling is as accurate as possible having used the most recent set of traffic data as collected for the project and from a range of reliable sources and using a best practice methodology. Modelling and traffic forecasting is a process of using current traffic demand and the best available information to forecast future traffic estimates and potential traffic impacts. All efforts have been made to ensure the inputs are as accurate and up to date as possible in order to obtain the most reliable forecasts from the modelling.

As with all modelling and forecasting, there is a requirement to make assumptions about future conditions. The assumptions used for the WRTM v2.3 were made by a working group chaired by NSW Roads and Maritime Services (Roads and Maritime) with representatives from Government agencies to obtain a consensus as to the appropriateness of the assumptions made. As a result of the requirement to make assumptions, modelling is not an ‘exact science’ but is however considered representative of future traffic conditions. Similarly, where other elements of the EIS rely on outputs from the traffic modelling, they are also subject to the same qualifications. Regardless, as already stated, every effort is made to ensure that the modelling and assessments are based on the most accurate data and information available.

Chapter 4 of the Appendix H (Technical working paper: Traffic and transport) of the EIS describes in detail the traffic and transport modelling inputs and sources of information. This includes information from Transport for NSW Transport and Performance Analytics (TPA) which uses current population and demographics data to establish existing and future conditions for the modelled scenarios. The approach taken provides an appropriate level of accuracy for assessing project impacts. The WRTM v2.3 uses data from across the Sydney metropolitan area which allows for an assessment of traffic impacts from the project that factors in background traffic influences from across the Sydney metropolitan area.

The use of the term ‘congestion’ has not been misleadingly used or defined in the assessment of traffic impacts. Congestion is a broad term, which when considered in relation to the assessment of impacts relates to the Levels of Service (LoS) at intersections and midblock portions of the road network. Levels of service are defined in the guidelines that inform the methodology for the assessment of traffic impacts. These guidelines are well known and commonly used and accepted in traffic and transport assessments for projects of a similar scale and nature.

The study area for this assessment was informed by the forecast traffic and transport changes from the WRTM v2.3, a strategic traffic model that covers the Sydney metropolitan area. The extent of the study area and the areas requiring operational modelling assessment were determined through analysis of forecast WRTM v2.3 traffic flow differences as a result of the project.

The study area broadly encompasses an area extending from the Parramatta River in the north to Sydney Airport in the south and from the Eastern Distributor in the east to Haberfield and Marrickville in the west. It is predominantly focused on the corridor between Haberfield and Rozelle, the corridor between Rozelle and St Peters, the corridor between Haberfield and St Peters, as well as the surface road networks around the Wattle Street, Rozelle and St Peters interchanges. Changes on strategic roads outside of this study area are assessed in the Sydney metropolitan road network sections and those outside the operational model areas are assessed through a screenline analysis, presented in Chapter 9 of Appendix H (Technical working paper: Traffic and transport) of the EIS. Further justification of the operational modelling areas is contained in Annexure B of Appendix H (Technical working paper: Traffic and transport) of the EIS.

The traffic assessment included in the EIS is for the design presented in the EIS, including all design changes.

The modelling has identified that there will be some construction related impacts at some locations as a result of the project. The assessment of operational impacts of the project show a justification for the project based on its long term positive benefits to the Sydney transport network. The same comparisons cannot be made for the shorter term construction impacts as these will not occur across the medium to long term and would be more localised than the wider operational benefits.

In relation to cycleway and pedestrian assessments a discussion of these issues is made in **section C8.6** which discusses the assessment of construction impacts to pedestrian and cyclists. The consideration of the time taken to complete active transport route diversions is implicit in the distance criteria (increased distance equates to increased travel time). The criteria is presented in terms of distance because it is a more objective criteria compared to travel time, which would vary depend on the mode of transport (walking or cycling) and the physical ability of the pedestrian or cyclist.

Chapter 25 (Hazard and risk) of the EIS provides a detailed assessment of the safety issues associated with the project including risks to public safety from incidents. Construction traffic movements that require changes to the road network would be designed in accordance with the relevant road safety guidelines. This includes consideration of safety for private vehicle, public transport and active transport users. Construction ancillary facilities would also be operated in accordance with a Construction Traffic and Access Management Plan (CTAMP) that would detail specific safety requirements for the operation of each construction ancillary facility and the adjoining road network to the extent necessary.

Full details of the traffic analysis undertaken for the EIS are contained in Appendix H (Technical working paper: Traffic and transport). In particular Chapter 4 of Appendix H contains the methodology used in the analysis including the input data used to inform the analysis. Chapter 6 described the existing traffic conditions based on the data collected as described in Chapter 4 and Chapters 7, 8, 10 and 12 analyse the construction impacts, operational impact 'Without the project', operational impacts with the project and the cumulative impacts of the project respectively. This analysis was undertaken by AECOM Australia Pty Ltd in consultation with Sydney Motorway Corporation (SMC) and Roads and Maritime.

C8.2 Level and quality of construction traffic assessment

1893 submitters have raised issues regarding the level and quality of the traffic assessment undertaken for the construction period. Refer to section 8.1 and Appendix H (Technical working paper: Traffic and transport) of the EIS for details of the assessment methodology.

C8.2.1 Construction traffic modelling scope and level and quality of the assessment

Submitters raised concerns regarding the level and quality of the construction traffic assessment. Submitters have raised concerns that the scope of the construction traffic modelling was not wide enough to identify the system-wide impact of construction traffic. Specific issues included:

- The EIS only analyses crash statistics near the interchanges
- The impact of construction vehicle traffic and parking has been underestimated and should be independently evaluated. Impacts in relation to construction worker parking have not been adequately assessed
- The impacts of construction traffic from the Rozelle Rail Yards on local streets have been underestimated in the EIS
- Request for further details of traffic modelling within 500 metres of the construction area near Rozelle
- Impacts of construction traffic on vehicular and pedestrian safety are not adequately assessed
- Direct and indirect traffic disruptions to local and arterial roads (in proximity to construction sites) have not been adequately addressed in the assessment
- Inadequate assessment of the impact of construction traffic outside of normal business hours

- Concern that in the event that construction of the project will worsen traffic congestion on Parramatta Road (as stated in the EIS), motorists will be asked to pay up to $20 a day in tolls This was not included in the construction assessment
- Impacts of construction traffic adding to travel times across the inner west have not been assessed
- No detail has been provided in the EIS regarding the proposed road closures in Leichhardt
- Assessment of impact on existing walking and cycling routes is only based on distance and excludes additional travel time
- Assessment of impacts to traffic caused by modifications to road and cycle networks has not been examined or included in section 4.43 Traffic and Transport of the Community Guide
- There is a lack of faith in EISs risk assessment of low for traffic management due to previous failures by contractors in M4 East to obey safety requirements
- The EIS has failed to address the cumulative impact of overlapping construction work forces and parking requirements, combined truck movements and other impacts
- The EIS does not contain enough detail on how the traffic on Parramatta Road at Camperdown will be impacted during construction, especially in the morning peak period
- The proponent only provides details of light and heavy vehicle volumes predicted to arrive and depart from construction ancillary facilities, such as the Darley Road civil and tunnel site (C4) during a typical AM peak hour, PM peak hour and daily period. This is an insufficient amount of information about the impacts. It does not make it clear what the impacts will be during the course of the project. It does not make it clear what the impacts will be during non-typical hours and during non-peak hours
- The impact of vehicle volumes is understated as only information on typical AM peak hour, PM peak hour and daily period was provided. What is typical is a subjective assessment. The project, including the Leichhardt area might end up with greater vehicle volumes and greater impacts because the EIS has been approved on the basis of typical AM peak hour, PM peak hour and daily period
- Concern that no detail has been provided in the EIS on what the car parking strategy as part of the CTAMP would look like and how it would be implemented.

Response

The EIS assessed the potential construction traffic and transport impacts of the project during a peak construction period. Based on the planned construction activities and indicative construction program, a worst case construction traffic scenario was assumed to be the period of spoil removal from tunnel construction during 2021. The current road network, with the addition of the M4 East and New M5 projects which should be operational well before 2021, was assumed for the road network in the construction scenario. The scope of the construction traffic assessment included all of the construction work within the project footprint. The project footprint is shown in Figure 6-1 to Figure 6-10 in Chapter 6 (Construction work) of the EIS.

The following guidelines were followed in carrying out the traffic and transport assessment:

- *Guide to Traffic Management – Part 3 Traffic Studies and Analysis* (Austroads 2007)
- *Traffic Modelling Guidelines* (Roads and Maritime 2013b)
- *Guide to Traffic Generating Developments Version 2.2* (Roads and Traffic Authority (RTA) 2002).

A three-stage traffic modelling and forecasting approach was used for the construction traffic assessment:

- The existing traffic and transport environment within the construction traffic study area was characterised using a combination of data from Transport for NSW TPA and Roads and Maritime, as well as traffic counts and survey data. Calibrated base year construction models were developed in LinSig (a micro-analytical network modelling software package widely used in Australia)

- The WRTM v2.3 was used to generate base and future year traffic demand matrices for the weekday AM peak and PM peak hours. The WRTM v2.3 accounts for the effects of tolls being levied on road network for toll roads and the wider surrounding networks. The forecast growth in travel demand and traffic volumes on the road network was derived for the construction traffic scenario from the WRTM v2.3 demand matrices. This growth in traffic volumes was then applied to the balanced turning counts, derived from traffic surveys undertaken on the road network, and used to create the background traffic flows (without construction) used in the 2021 construction models. This approach makes the best use of observed traffic count data as the basis for future year travel demand and traffic volumes and patterns. The performance of the intersections and mid-blocks in the vicinity of the construction ancillary facilities without construction traffic was then calculated for the 2021 AM and PM peak hours
- Construction traffic was added to the background traffic. This was based on the proposed construction methodology, covering vehicle types, volumes and construction traffic routes to and from the various construction ancillary facilities. The performance of the intersections and mid-blocks in the vicinity of the construction ancillary facilities with the construction traffic was then calculated for the 2021 AM and PM peak hours to assess the future performance of the road network during construction. The modelling assessed the combined road network impacts of all proposed construction ancillary facilities operating concurrently.

It should be noted that the volumes of construction traffic anticipated for the project are very small relative to background traffic for construction traffic haulage. The impact of such small changes in traffic volumes due to construction vehicles would therefore generally be minor.

When assessing safety impacts, crash statistics of the existing road network were analysed. The focus of the traffic crash analysis was around the interchange sites as this is where the primary impact of the project on the road network would occur. Due to the nature of construction works, temporary and staged modifications to areas in the immediate vicinity of construction ancillary facilities would be made. These changes and associated safety management would be detailed in the CTAMP.

Traffic modelling was undertaken to determine the potential impact of construction traffic within the study area. This included modelling intersections in close proximity to the identified construction ancillary facilities. The EIS identified that these intersections would generally operate within an acceptable level of service (LoS), with some intersections experiencing congestion during peak times (refer to section 7.4.3 and 7.5.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS). To overcome congestion during peak times and improve access and the safe operation of the network the EIS has identified a range of management measures that would be incorporated into the CTAMP. This includes monitoring traffic flow by closed-circuit television (CCTV) to allow adaptive responses to traffic management to alleviate congestion and allow rapid response to safety issues. The specific commitments made in regards to the CTAMP preparation and implementation are described in section 11.1.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS and in **Chapter E1** (Environmental management measures).

All temporary road closures proposed during the construction phase of the project are detailed in Table 7-22 in Chapter 7 of Appendix H (Technical working paper: Traffic and transport) of the EIS.

All proposed road impact during the construction period including impacts to Parramatta Road during construction are assessed in section 7.4 and 7.5 of Appendix H (Technical working paper: Traffic and transport) of the EIS. The construction modelling forecasts a number of intersections to operate with high levels of delay (LoS) E or F in the 'without construction' scenario. In the 'with construction' scenario, the performance at most intersections along Parramatta Road is impacted, with larger impacts forecast to occur at the intersections along Wattle Street and Dobroyd Parade. Mitigation measures for construction impacts are discussed in section 11.1.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS and in **Chapter E1** (Environmental management measures). The construction methodology uses future traffic volume forecasts derived from the WRTM v2.3. Where toll roads are operational in the construction assessment year, including the M4 East and New M5, this is reflected in the forecast traffic demands.

Construction impacts to travel times across the inner west would be highly localised impacts around each of the construction ancillary facilities compared to the operational scenarios, with small changes to traffic volumes. A representative assessment of travel times for the construction scenarios therefore cannot be made. Similarly impacts to travel times for active transport cannot be assessed as a comparison cannot be made between different individuals' abilities to utilise shared paths. Importantly construction works would not result in significant changes in distances required to traverse existing active transport routes therefore travel times would not vary significantly.

The traffic assessment considers worst case AM and PM peak hour scenarios. Impacts outside these times would be expected to be less given lower volumes on road network in non-peak periods. A submission makes reference to the use of typical AM and PM peak hour traffic level and indicated that this is subjective and therefore not representative. Background traffic data used in the model was obtained from traffic counts of actual traffic conditions at various locations across the study area of the Technical working paper: Traffic and transport. Modelled conditions are therefore based on actual conditions and have not been subjectively derived. The impact of the small changes to traffic volumes arising from construction traffic in off-peak hours would therefore be small.

Assessment of the cumulative impacts of the project, including the potential cumulative impacts of construction traffic is addressed in Chapter 26 (Cumulative impacts) of the EIS.

No specific detail has been provided in regards to the car parking strategy as these have not yet been prepared. The car parking strategies would be prepared by the design and construction contractor(s) and the form and content would be developed specifically for this project and its construction ancillary facilities. It is noted that similar strategies have been developed for preceding stages of WestConnex. These are publically available and provide a guide how the similar strategies developed for this project would operate.

A submission noted that construction impacts on the existing walking and cycling routes is only based on distance and excludes additional travel time. In regards to assessing travel time of active transport routes there is a high amount of variability in people ability to walk or cycle at different speeds. Therefore, a general comparison cannot be made. Distance however provides a good indication of how travel time would change. For example, if the distance is doubled it could reasonably be assumed that the travel time would also double.

C8.2.2 Assessment of construction traffic impacts at the Darley Road civil and tunnel site

Concerns and queries relating to traffic, transport and access impacts from the Darley Road civil and tunnel site (C4) are addressed in **Table C8-1**.

Table C8-1 Traffic, transport and access impacts from the Darley Road civil and tunnel site (C4)

Concern or query	Response
The EIS states that there are investigations occurring into alternative access into the Darley Road civil and tunnel site but does not provide any detail on which residents can comment	Options for alternate access for heavy vehicles at the Darley Road civil and tunnel site (C4) have been investigated as part of ongoing design development and in response to feedback received on the EIS. Construction access for heavy vehicle entering the Darley Road civil and tunnel site has been amended to remove the right-hand turn from City West Link into Darley Road as described in **section C4.17.1**. These options have been identified as possible alternatives to the access arrangement described in the EIS. The final access arrangement for the Darley Road civil and tunnel site (C4) would be identified following the appointment of a design and construction contractor(s). The design presented by the design and contractor(s) would be consistent with the environmental performance outcomes and environmental management measures described in the EIS, changes identified in this Submissions and preferred infrastructure report, the conditions of approval for the project and other requirements identified during the assessment of the project.

Concern or query	Response
The EIS does not provide any assurance that impacts such as congestion caused by the additional 170 vehicles movements a day at the Darley Road civil and tunnel site will be managed. There is no guarantee that there will only be 170 vehicle movements a day because the EIS is indicative only	Table 7-19 of Appendix H (Technical working paper: Traffic and transport) of the EIS summarises the mid-block operational performance summary with and without construction vehicles in the 2021 AM and PM peak periods. For Darley Road (west of James Street), construction traffic is forecast to change the mid-block LoS in the PM peak eastbound direction only. The mid-block LoS drops but remains at an acceptable LoS D. The EIS commits to the management of construction traffic impacts, including the forecast movements from heavy and light vehicles from the Darley Road civil and tunnel site. The final number of movements per day from this site would be subject to design and contractor(s) requirements, however, would need to be appropriately managed through the CTAMP.
The traffic impact at the Darley Road site is inadequate. The surrounding roads of Norton Street and Balmain Road, and the link onto City West Link will not be able to cope with the additional construction traffic	A description of the three-stage traffic modelling and forecasting approach that was used for the construction traffic assessment is included in **section C8.2.1**. Norton Street and Balmain Road have not been identified as construction haulage routes and construction of the project is therefore not expected to impact on the performance of these roads. Table 7-20 of Appendix H (Technical working paper: Traffic and transport) of the EIS indicates that the City West Link/James Street intersection would operate at LoS F with or without construction traffic. The forecast construction volume is not large (150 per day or less than one per cent of the total traffic) in the peak periods and so the impact is not forecast to be significant.
The EIS needs to detail the increased risk in crashes that will be caused by the additional 170 vehicles movements a day at Darley Road and how the risk will be managed	As described in section 7.4.5 of Appendix H (Technical working paper: Traffic and transport) of the EIS, the volume of traffic generated by construction is expected to be low compared to existing traffic. These construction vehicles generally represent a small increase compared to background traffic. The effects of this increase on the existing road network are therefore not expected to substantially impact road safety in the traffic and transport study area. There is still a risk with construction traffic interacting with general traffic, with elevated risk when construction-related vehicles are entering and leaving construction sites. Any foreseen impacts on road safety for all users during construction would be mitigated as much as possible through the provision of tailored traffic management plans and other measures detailed in **Chapter E1** (Environmental management measures).
The EIS does not provide any detail as to the number of crashes at the James St/City West Link intersection which, on Transport for NSW's own figures, is the third most dangerous intersection in the inner west	Table 6-12 of Appendix H (Technical working paper: Traffic and transport) of the EIS lists crash data for City West Link between James Street and Victoria Road incorporating this intersection.
The EIS does not comment on the two fatalities which occurred near the location of the Darley Road civil and tunnel site	See response above.

Concern or query	Response
Darley Road is congested from 7:00 am to 9.30 am and 4:00 pm to 6.30 pm, well outside of the 'peak' periods identified in the EIS	The AM and PM peak hour used in Appendix H (Technical working paper: Traffic and transport) of the EIS refers to vehicle trips arriving at their destination during the average peak one hour in the: • AM peak period: between 7.00 am to 9.00 am on a normal working weekday • PM peak period: between 3.00 pm to 6.00 pm on a normal working weekday. These average peak one hour periods are representative of the most congested periods of the day on the road network and therefore represent a worst case or conservative assessment of potential impacts from construction traffic.
Traffic around Darley Road is equally as busy on Saturday but this is not accounted for or acknowledged in the EIS	See response above. The representative AM and PM peak one hour periods on a normal working weekday would encompass expected traffic volumes on weekends.
There is no plan in the EIS to manage the increased vehicle movements around Darley Road	The EIS commits to the management of construction traffic impacts, including the forecast movements from heavy and light vehicles from the Darley Road civil and tunnel site (C4). The final number of movements per day from this site would be subject to design and construction contractor(s) requirements, however, would need to be appropriately managed by the CTAMP. It is also noted that the CTAMP and related sub-plans will all be publically available. In addition, options for alternate access for heavy vehicles at the Darley Road civil and tunnel site (C4) have been investigated as part of ongoing design development and in response to feedback received on the EIS. As described in **section C4.17.1**, trucks will no longer be able to right turn into Darley Road from City West Link. Instead they will now turn around at James Craig Road, Rozelle so they can turn left into Darley Road. The final access arrangement for the Darley Road civil and tunnel site (C4) would be identified following the appointment of a design and construction contractor(s). The design presented by the design and contractor(s) would be consistent with the environmental performance outcomes and environmental management measures (see **Chapter E1** (Environmental management measures)), changes identified in this Submissions and preferred infrastructure report, the conditions of approval for the project and other requirements identified during the assessment of the project by the NSW Department of Environment and Planning (DP&E).

Concern or query	Response
The EIS states that 'temporary diversions along Darley Road may be required during construction' however does not provide any detail as to when these diversions would occur, whether there is provision for consultation with the community, details on how long the diversions will be in place and the impact of diversions on local roads or the amenity of residents	The need for temporary diversions to be put in place on Darley Road during construction would be subject to design and construction contractor(s) requirements. As part of the CTAMP there are requirements for the design and construction contractor(s) to consult with impacted residents and relevant councils. The CTAMP will also be publically available and regular construction updates will be issued providing details of proposed changes to traffic conditions such as temporary diversions and the measures that are proposed to address related impacts. Temporary diversions and/or lane closures along Darley Road may be required to enable construction vehicle access to be established. There may also be a need to temporarily occupy one lane of traffic during site establishment for other construction activities, however these instances would be limited and would typically occur during the non-peak periods. The design and construction contractor(s) would be required to obtain a road occupancy licence from the Transport Management Centre (TMC) for works which: • Slows, stops or otherwise delays traffic • Diverts traffic from its normal course along the road carriageway, including lane closures, turning restrictions, detours and diversions • Occupies any portion of a local road that is normally available as a trafficable lane. Road occupancy licences would be subject to the specific period of operation stated on the approved licence and any associated conditions.
Concern with the quality of the construction traffic assessment as it lacks specific measures addressing the increase in traffic in Foster Street due to works in Darley Road	Table 7-19 of Appendix H (Technical working paper: Traffic and transport) of the EIS summarises the mid-block operational performance summary with and without construction vehicles in the 2021 AM and PM peak periods. For Darley Road (west of James Street), construction traffic is forecast to change the mid-block LoS in the PM peak eastbound direction only. The mid-block LoS drops but remains at an acceptable LoS D. Foster Street is not identified as a spoil haulage route for construction traffic. Although spoil haulage vehicles would not use the section of Darley Road west/south of the Darley Road/Charles Street intersection, Darley Road and Foster Street are part of the arterial road network and may be used by other heavy and light vehicles (such as concrete delivery trucks and construction worker vehicles). Heavy and light vehicle movements during construction would be managed in accordance with the environmental management measures described in **Chapter E1** (Environmental management measures), the conditions of approval and the CTAMP that would be prepared for the project.

Concern or query	Response
Construction traffic impacts on public transport, pedestrians and cyclists have not been addressed	Sections 7.4 and 7.5 of Appendix H (Technical working paper: Traffic and transport) of the EIS describes potential impacts of construction on public transport and active transport. Section 11.1 of Appendix H identifies management measures to minimise the identified impacts to public transport and active transport. These are outlined in **Chapter E1** (Environmental management measures).
The EIS fails to describe the construction truck route options available in relation to the Darley Road site	Chapter 6 (Construction work) of the EIS describes construction heavy vehicle route options, including for Darley Road. Due to the proximity of the Darley Road site to City West Link, the preferred option is to have construction heavy vehicles traverse the small section of Darley Road that connects immediately with City West Link to the northeast. As described in **section C4.17.1**, heavy vehicles will now turn at James Craig Road and travel from the now proposed White Bay civil site (C11) to turn left into Darley Road.
Request for an independent review of the construction impacts on traffic at Darley Road	As part of this EIS exhibition and submissions process, reviews of the construction traffic impact assessment have been undertaken by a range of government agency and community stakeholders. The CTAMP that will be prepared by the design and construction contractor(s) prior to any construction works will be reviewed by the Sydney Coordination Office, TMC, local councils and other relevant stakeholders. This will provide an opportunity to provide feedback that is current at the time of the CTAMP preparation so relevant impacts can be addressed.
Lack of assessment of impacts in relation to route identification and scheduling of transport movements, particularly outside standard construction hours and including consideration of peak traffic times and sensitive road users and parking arrangements	Routes to and from construction ancillary facilities and the arterial and motorway network have been outlined in the EIS (see Chapter 6 (Construction work)). These are the points that would experience most impact as a result of construction traffic. The traffic assessment focussed on peak hours as this allows for an assessment of worst case impacts for all road users. Outside standard construction hours, traffic levels are generally lower and therefore there is more capacity on the network to accommodate construction traffic. Section 7.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS provides details of the available parking spaces at each construction ancillary facility and the likely parking demand generated during construction. Management measures have been proposed at reducing parking demand from construction workers.
Request for additional information on the number of vehicles arriving and departing Darley Road on an hourly basis	On Darley Road west of James Street the project is forecast to generate no change eastbound and 10 vehicles per hour westbound during the AM peak and 70 vehicles eastbound and no change westbound during the PM peak.
The impacts on parking provisions have not been adequately assessed	Construction parking impacts are addressed in **section C8.8**.

Concern or query	Response
Lack of information and assessment regarding the arriving and departing times of shift workers from the Darley Road civil and tunnel site (C5)	Arrival and departing time of shift workers has not yet been fixed. Flexibility has been provided so times can be adjusted to best fit project requirements and also allow changes to minimise impact to traffic.
The light vehicles impacts at the Darley Road site have not been assessed	These vehicles numbers have been assessed. Light vehicle numbers are incorporated in the above listed peak hour traffic movements.
Assessment of the impacts of out of peak hours at Darley Road is insufficient. The proponent should know the details of expected construction volumes based on work currently being carried out in the rest of WestConnex	The above listed traffic movements are consistent with a worst case number of movement during any time of the day including peak hours and out of peak hours. As background traffic levels are lower during out of peak hours so would the overall level of congestion as assessed. Therefore, there would be less impact out of peak hours and no need for additional assessment.
The proponent and SMC should be able to provide more detail about what the vehicle volumes would be for the project, based on information from Stage 1 and Stage 2 of WestConnex. In relation to the Darley Road civil and tunnel site this should include: • More than just typical volumes and peak hour volumes • How many vehicles will be arriving and departing from the site on an hourly basis at the various stages of the project • Should describe what a typical day would look like hour by hour in terms of vehicle arrivals and departures at specific points in the project • Should describe what a non-typical day would look like and what might cause a non-typical day to occur	Section 7.4 and 7.5 of Appendix H (Technical working paper: Traffic and transport) of the EIS provides estimated peak hour traffic levels at various locations across the study area, including around the Darley Road civil and tunnel site, for both assessed construction options both 'with and without the project. The difference between the background and 'With project' scenarios is the construction generated vehicle movements. Peak hour volumes have been assessed as these are the busiest time of the day with all other hours considered to generally have lower traffic levels. The construction scenarios assessed are based on the maximum level of traffic that is likely to be generated from each construction ancillary facility. This allows assessment of the greatest construction impact and appropriate management measures to be proposed accordingly. It would not be practical to assess every different hour of the day for every stage of the project. The management measures developed to address the worst case impacts, as assessed, are considered suitable of management impacts during times of lower traffic generation, or from lower background traffic conditions.

Concern or query	Response
The proponent has failed to assess the impacts of potential spoil haulage options including: • Staging trucks from Sydney Ports at James Craig Road • Creating an off-ramp from City West Link near Leichhardt North Light Rail • Running trucks underground in established tunnels. These spoil haulage routes will have different impacts and the proponent is obliged to identify them	An additional construction ancillary facility (the White Bay civil site (C11)) is proposed near White Bay at Rozelle, on land owned by the Port Authority of NSW. The facility would provide a truck marshalling area and worker parking that would primarily service the mainline tunnelling sites at Haberfield and Ashfield, Darley Road and Pyrmont Bridge Road, where space for truck queuing on-site is limited. Impacts associated with the facility are assessed in **Chapter D2** (White Bay civil site (C11)). It should also be noted that additional assessment of the potential construction impacts of the White Bay civil site including additional traffic modelling have been undertaken. Results of this assessment are contained in **Appendix A** (Traffic and transport assessment). Opportunities to use the M4 East and New M5 tunnels for spoil haulage will be considered at detailed design to reduce impacts on the surface road network. The use of the tunnels would be associated with reduced impacts compared to the impacts assessed in the EIS. The project does not propose to construct an off-ramp from City West Link. The refinement of the design of the Darley Road civil and tunnel site is described in **section C4.18.1**. The detailed design will be reviewed against the concept design, EIS and approval conditions, to determine whether the detailed design is consistent with the approved scope and, if not, further assessment and approval would be required under the *Environmental Planning and Assessment Act 1979* (NSW). If further assessment and approval is required, the applicable statutory process for modification of the project will be followed prior to the commencement of construction of the relevant aspect of the project, which would provide the community with an opportunity to comment on any modification to the project.
There are no details of staged spoil haulage proposal at Darley Road site as was advised	A description of construction activities, including proposed spoil haulages from each construction ancillary facility is provided in section 6.5 of the EIS. Indicative construction staging and timeframes are also provided. Spoil haulage from the Darley Road civil and tunnel site and the Rozelle civil and tunnel site would be via City West Link. An additional construction ancillary facility (the White Bay civil site (C11)) is proposed near White Bay at Rozelle, on land owned by the Port Authority of NSW. The facility would provide a truck marshalling area and worker parking that would primarily service the mainline tunnelling sites at Haberfield and Ashfield, Darley Road and Pyrmont Bridge Road, where space for truck queuing on-site is limited.

C8.3 Construction traffic routes

1301 submitters have raised issues regarding construction traffic routes and numbers of construction vehicles in the study area. Refer to section 8.3 of the EIS for details of potential construction traffic and transport impacts.

C8.3.1 Construction vehicle routes

Submitters raised the following issues relating to construction vehicle routes:

- Objection/concern to truck routes on and in the vicinity of construction ancillary facilities for the project
- Vehicles will use dispersed routes, meaning construction vehicles will use and park on local roads. The EIS should provide an agreed route using arterial roads only that can be used by all vehicles associated with the project
- The EIS states construction vehicles are able to use local roads in exceptional circumstances, including for queuing at the construction ancillary facilities, including Darley Road civil and tunnel site (C4) and the Pyrmont Bridge Road tunnel site (C9). Request for amending this to ensure trucks never use local roads except in an emergency
- It is unclear whether light construction vehicles travelling to and from the Iron Cove Link site (C8) will carry spoil
- Concerned with the trucks entering and exiting the Pyrmont Bridge Road site
- All heavy construction traffic should be confined to the Western Distributor – residential streets are not an option
- Objection to traffic movements at Rozelle Rail Yards and The Crescent civil site
- Spoil haulage routes not defined for Victoria Road civil site and Iron Cove civil site
- Objection/concern to truck routes on and in the vicinity of:
  - Wattle Street
  - Gordon Street intersection with Victoria Road
- Access arrangements for Darley Road site will create traffic conflict at the shared entry/exit driveway near Hubert Street
- Trucks accessing the Darley Road site may use local roads such as Charles Street, William Street Hubert Street and Francis Street, which would impact residents
- The contractor who is appointed to the project will be allowed to use local roads and will not be able to stop sub-contractors using local roads
- The EIS has failed to provide details (plans) of alternative spoil haulage routes for the Parramatta Road West civil and tunnel site (C1b)
- Request for a condition of approval that the alternative access route be used for the Darley Road site and no spoil trucks be permitted onto Darley Road due to noise, safety and traffic issues. A submitter also did not want other areas to be subjected to increased, diverted truck movements to shift the problem elsewhere
- Request for details of truck routes to and from the spoil management sites listed in Table 8-41 of the EIS.

Response

The project has been designed to minimise the generation of construction traffic where feasible and reasonable. The assessment of construction traffic impacts has taken into account heavy vehicle movements (including spoil haulage) to and from construction ancillary facilities.

In developing construction methodologies and a construction program for the project, the aim has been to minimise the duration of the construction period while maintaining an acceptable and manageable amenity outcome for surrounding receivers. This has required a balance between the speed of construction activities and the ability to reasonably and feasibly maintain impacts within acceptable limits. Opportunities to further reduce construction timeframes while protecting local amenity will be considered during the detailed design process.

Tunnel construction activities would operate 24 hours a day, seven days a week. During the peak construction periods spoil haulage would occur 24 hours a day, seven days a week at tunnelling support sites, with the exception of the Darley Road civil and tunnel site (C4) where spoil haulage would be restricted to standard construction hours. Heavy vehicle movements associated with the removal of spoil from tunnelling would occur via ingress and egress directly to and from the arterial road networks. Pyrmont Bridge Road would be accessed by construction traffic but heavy vehicles would only move a short distance westbound on Pyrmont Bridge Road towards Parramatta road and not in the opposite direction. Where possible for the construction ancillary facilities in and around Rozelle, heavy vehicle traffic would move towards the Western Distributor or City West Link via the most direct route. No local roads are proposed to be used for spoil haulage. Some use of local roads by heavy vehicles delivering materials and/or equipment may be required, however this would be minimised as far as practicable and would be managed in accordance with the conditions of approval and the CTAMP that will be prepared for the project. Spoil removal outside standard construction hours would meet the relevant noise criteria.

Construction traffic movement from Rozelle Rail Yards and The Crescent civil site was objected to by a submission. It is not feasible to remove traffic generating activities from these locations as they are vital to the project. Regardless, the forecast traffic generated from these locations has been fully assessed and appropriate management measures proposed.

Spoil would be transported from construction ancillary facilities to spoil management locations along arterial roads and the M4 East Motorway, the New M5 Motorway, the M5 East Motorway and the M5 South West Motorway.

There is no provision at the Iron Cove Link civil site (C8) site to operate roadheaders (as tunnel excavation of the Iron Cove Link is anticipated to occur from the Rozelle civil and tunnel site (C5)), however the site may be used to support limited excavation of the initial sections of the Iron Cove Link tunnels. Heavy vehicles associated with the Iron Cove Link civil site (C8) would therefore only transport spoil during the period where these initial excavations are being undertaken.

Trucks accessing the Darley Road civil and tunnel site would do so via Darley Road with connection directly to City West Link which would then provide connection to the wider arterial road network. Heavy vehicle traffic would not use Charles Street, Hubert Street William Street or Francis Street. A submission has also asked that alternative access route be provided to the Darley Road civil and tunnel site (C4), that no spoil trucks be permitted onto Darley Road and also that other areas not be subjected to increased truck movements. Due to proximity of the Darley Road civil and tunnel site (C4) to the light rail line and City West Link, it is only accessible via Darley Road. Construction traffic would utilise the arterial road network as far as practical to avoid impacts to local roads or residents.

Traffic movements on local roads are necessary in some instances to gain access to the construction ancillary facilities due to their specific site constraints. Where access requires local roads to be traversed the project has sought to minimise the distance of local roads that needs to be traversed. Construction haulage routes between the construction ancillary facilities and the proposed spoil management sites are listed in Table 6-21 of the EIS. It is the intent to minimise heavy vehicle movement on local roads and undertake spoil haulage on the arterial road network.

Temporary road network changes, closures and diversions of local roads for the construction of the project are described in Table 6-19 of the EIS and in sections 7.4.4 and 7.5.3 of Appendix H (Technical working paper: Traffic and transport) of the EIS.

A truck management strategy as part of the CTAMP (see environmental management measure TT16 in **Chapter E1** (Environmental management measures) will be developed for the project that:

- Identifies truck marshalling areas that will be used by project-related heavy vehicles
- Describes management measures for project-related heavy vehicles to avoid queuing and site-circling in local roads and other potential traffic and access disruptions
- Describes monitoring programs to demonstrate that project-related heavy vehicles are complying with the strategy.

A submission was concerned that trucks would be allowed to utilise local roads in exceptional circumstances and that use of local road should only occur in an emergency. A component of the overarching strategy of the CTAMP will be to minimise the use of local roads for heavy vehicles access, which will include consideration of the exceptional circumstances referred to in Chapter 6 (Construction work) of the EIS. Provisions for the use of local roads by project-related heavy vehicles would be detailed in the CTAMP, which would be prepared in consultation with relevant transport stakeholders and local councils.

C8.3.2 Construction traffic numbers and vehicle travel times

Submitters raised general concerns relating to the assumptions of construction vehicles, and proposed vehicle travel times. Specific concerns include:

- The use of trucks 24 hours per day, seven days per week during construction. Specific concern was raised over 24 hour truck movements near the Darley Road civil and tunnel site (C4), Option B sites and in the Rozelle/Iron Cove Peninsula
- The volume of heavy vehicles and the impacts on the operation of the road network are not clearly defined
- Spoil haulage hours will not be restricted to normal business hours
- 24 hours per day, seven days per week during construction spoil haulage from the Parramatta Road sites
- The large numbers of vehicles to Rozelle Rail Yards, 517 heavy trucks of which 46 are to take place during peak hours
- The contractor who is appointed to the project will be allowed to use local roads and will not be able to stop sub-contractors using local roads
- Query about why SMC is allowed to have 200 additional trucks a day on Darley Road but the Development Approval for the retail outlet at 7 Darley Road was rejected three times as the council said that the road could not handle 60 trucks a week.

Response

Table 7-15 in Appendix H (Technical working paper: Traffic and transport) of the EIS identifies indicative daily and peak period construction traffic volumes for each of the proposed construction ancillary facilities. In addition, **Appendix A** (Traffic and transport assessment) presents indicative construction traffic volumes for the proposed White Bay civil site (C11) including truck marshalling facility. Typically, the proposed vehicle numbers represent a very small increase in vehicle movement during peak hours above the background traffic levels. The number of traffic movements per day may vary from that presented in the EIS and the preferred infrastructure report.

However, these estimates are representative of what the construction impacts will be during the peak construction period for each construction ancillary facility. The period of peak construction for each ancillary facility is aligned with the proposed schedule for tunnelling work that would be undertaken from that ancillary facility due to the need to move spoil out of the site. Peak heavy vehicle traffic is forecast to be less outside of these tunnelling work periods and therefore not at the identified levels for the five year construction period.

In relation to the Darley Road civil and tunnel site (C4), this means that peak construction traffic generation would occur for around two years of the five year construction program and for the Rozelle civil and tunnel site (C5), it would be for around two and a half years. Allowing truck movements 24 hours per day, seven days per week at the Rozelle civil and tunnel site (C5) and the other tunnelling sites (except for at the Darley Road civil and tunnel site (C4)) will mean that the design and construction contractor(s) will be able to maximise truck movements outside of peak times. This would not only limit the impacts on congestion during peak hours but would help reduce the overall construction period and therefore the length of time construction impacts would be experienced.

Spoil removal from the Darley Road civil and tunnel site (C4) would only occur within standard construction hours, between 7.00 am and 6.00 pm Monday to Friday, and between 8.00 am and 1.00 pm on Saturdays. Traffic from Darley Road has ready access to City West Link, which reduces the need to traverse residential areas. Due to the movement of vehicles directly to the arterial network and then towards spoil management areas, impacts to the wider suburb of Rozelle and areas around Iron Cove would be limited.

It is also noted that the construction traffic movements proposed by the project from the Rozelle Rail Yards represent a small fraction of total traffic during construction periods. As a result, their impact on the operation of the road network is relatively minor with congestion already an issue regardless of the project.

There is concern regarding spoil haulage from Parramatta Road civil and tunnelling sites 24 hours per day sites. These sites have direct access to the arterial road network. In order to take advantage of this access and maximise the efficiency of the construction works, haulage 24 hours per day can shorten the overall construction period. Traffic impacts would also be lower outside of peak and daytime hours meaning less overall impact on the road network.

A submission questioned why the project could proceed with the proposed number of truck movements when the retail outlet at 7 Darley Road was rejected three times at the adjoining site due to truck movements. It is noted that retail outlet is now operational and that they would have had to implement traffic movement and management measures to satisfy the determining authority. The project has proposed management measures in a similar manner to appropriately manage its impacts. Also the project construction traffic would not be permanent and only for the construction period. Regardless, the project and the existing development cannot be otherwise compared due to their significantly differing nature.

Construction traffic would result in an increase in light and heavy vehicles on the identified access roads connecting to the construction ancillary facilities (refer to section 8.3.1 of the EIS). This increase would be minor however with the proposed construction traffic representing a small portion against background levels in most instances. In regard to the significance of the impacts of construction traffic, as noted in the EIS, a number of roads in proximity to the construction ancillary facilities would be operating at mid-block LoS D or worse in the 'Without construction' scenario. However, even with the addition of construction traffic, the modelling indicates that the majority of modelled roads would remain at their existing LoS. This suggests that the additional construction traffic generally does not have a significant impact on the operation of these roads.

This would not be the case for all roads, with construction modelling forecasting impacts to the performance of intersections along Parramatta Road, Wattle Street and Dobroyd Parade (refer to section 8.3.1 of the EIS for further information). These impacts would only be for the duration of construction, with the worst case forecast impacts occurring during the two year peak construction time. The project is predicted to improve road network functionality and reduce congestion once operational.

The design and construction contractor(s) and any sub-contractors working on the project would be required to meet the requirements of the CTAMP. This includes identifying designated routes for project-related heavy vehicles and communicating them to all relevant drivers as reflected in environmental management measure TT15 in **Chapter E1** (Environmental management measures) and implementing monitoring programs to demonstrate that drivers are complying with the truck management strategy as reflected in environmental management measure TT16 in **Chapter E1** (Environmental management measures).

C8.4 Construction impacts on network performance

2684 submitters have raised issues regarding the performance of the road network during the construction phase. Refer to section 8.3 of the EIS for details of potential construction traffic and transport impacts.

C8.4.1 Impacts on network performance during construction

Submitters raised general concerns relating to the impacts on the performance of the road network during construction of the project. Specific concerns include:

- Local and arterial roads will experience direct and indirect traffic disruptions (such as lane and street closures and diversions) across Ashfield, Haberfield, St Peters, Camperdown, Annandale, Lilyfield, Leichhardt, and Rozelle
- Construction works would increase daily traffic on Anzac Bridge therefore straining the road network, which is already close to capacity
- Traffic is already congested on Victoria Road between Iron Cove Bridge and Gladesville Bridge, which will be heavily affected during tunnel construction

- Disruption to traffic flows and congestion will be caused on Sydney's road network from construction traffic
- The two entrances on City West Link, one opposite the exit of The Crescent and one around 400 metres further west on City West Link will have to have traffic controls set up to allow trucks to access and exit. Traffic congestion will increase in this area as a result
- Streets between Victoria Road and the former Rozelle Hospital have restrictions on the size of trucks allowed to access and now this area will become a construction zone, creating congestion
- Congestion on City West Link, Johnston Street, The Crescent, Catherine Street, James Craig Road, surrounds of Rozelle Public School, Bland Street, Bridge Street, Western Distributor, Wattle Street, McEvoy Street, Norton Street, Gordon Street, Lilyfield Road, Parramatta Road, Byrnes Street, Ilford Avenue, Victoria Road, Waratah Street, Waterloo Street and Ross Street will greatly increase during the construction period
- The intersection at James Street and City West Link already has queues at the traffic lights
- The project will induce traffic around the St Peters interchange during construction
- The widening of The Crescent between City West Link and Johnston Street with an extra lane being constructed will lead to heavy traffic congestion
- Concerned about the effect the construction route through Liverpool Road will cause additional congestion
- Stage 3 would significantly increase local traffic in Haberfield including spoil removal via heavy trucks and light vehicles used by contractors and workers.
- Extra congestion will be brought to Glebe and Forest Lodge by construction vehicles
- The widening of The Crescent between City West Link and Johnston Street with an extra lane being constructed will lead to heavy traffic congestion on a road that has three primary/infants schools
- Concerned about the choice of the Camperdown dive site as the area is densely settled and congested.

Submitters raised particular concerns regarding the network performance around the Darley Road civil and tunnel site. These concerns include:

- Increased commuter travelling times and congestion on City West Link
- Darley Road is already at capacity and the site cannot accommodate the project construction traffic
- Changes to traffic performance coming in and out of the Canal Road Film Centre (behind Blackmore Park) as a result of the construction works at Darley Road
- Darley Road acts as a critical access road for Leichhardt residents to access and cross City West Link. The intersection at James Street and City West Link already has queues at the traffic lights. The other option to cross City West Link is Norton Street, which is already congested
- Road closures and diversions around the Darley Road civil and tunnel site will place pressure on the local road network
- Concern about motorists and trucks avoiding congestion during construction via local roads such as Booth Street, Camperdown.
- The increase of traffic on Darley Road during construction would also increase both local traffic and outer area traffic at peak commute times
- Spoil trucks at the Darley Road site will create traffic queues and increase traffic on local streets
- The EIS should provide an agreed route (using arterial roads only) that can be used by all vehicles associated with the project to manage congestion from construction vehicles at Darley Road.

Response

Submitters raised concerns over construction traffic, including light and heavy vehicles, generating significant traffic volume increases on the road network across a number of locations and causing increased congestion on the road network. This includes the potential for traffic impacts across suburbs including Ashfield, Haberfield, St Peters, Camperdown, Annandale, Lilyfield, Leichhardt, and Rozelle. The construction of the project will not result in a significant increase in vehicle numbers on the road network. Compared to existing traffic levels, construction traffic represents a very small relative increase in traffic. Impacts to suburbs such as Glebe or Forest Lodge are expected to be minor as there is no need for heavy vehicles to traverse these suburbs. Some light vehicles from construction staff may travel through these suburbs but this would represent an insignificant proportion of background traffic.

The potential for widespread disruption is unlikely and only those specific roads that have been identified in the EIS for construction diversions or closures would be affected. Potential impacts to streets mentioned in submissions such as local roads surrounding Rozelle Public School, Bland Street, Bridge Street, Byrnes Street, Ilford Avenue, Waratah Street, Waterloo Street and McEvoy Street are unlikely to occur and/or would not result in worsening existing levels of service.

Appendix H (Technical working paper: Traffic and transport) of the EIS provides the existing peak hour performance of key routes in and around the project footprint. In proximity to Rozelle, roads were found to have existing traffic levels (vehicles per day, one way) of about 37,000 on City West Link, 12,000 on The Crescent, 20,000 – 30,000 on Victoria Road and 60,000 – 70,000 on Anzac Bridge. Construction vehicle movements along spoil haulage routes in most instances would be less than one per cent day resulting in minimal changes to traffic conditions when compared to background traffic. As a result, changes to any pre-existing capacity issues on parts of the network, including increased commuter times, are unlikely or would be minimal.

Works would be carried out to realign The Crescent and reconstruct the intersection with City West Link. The new alignment of The Crescent would be constructed ‘offline’ (that is, next to the existing alignment). Traffic would be switched onto the new alignment when ready, and the old alignment of The Crescent would be demolished. All traffic lanes in each direction would generally be maintained with some short-term lane closures (outside of peak periods where feasible and reasonable) subject to road occupancy licences

Construction related traffic around The Crescent, was found to result in a reduction in the PM peak hour mid-block LoS on City West Link, west of The Crescent, with the westbound mid-block LoS forecast to decrease from LoS D to LoS E. A reduction in LoS of City West Link intersection with The Crescent from LoS D to LoS E is forecast during the AM peak hour. This is unlikely to have an impact on any schools along Johnston Street. No changes in levels of service are forecast in other peak periods.

Where impacts are predicted to occur, congestion is already occurring from the high levels of background traffic. Regardless, these works would be undertaken in accordance with the CTAMP which will include a staging plan that will identify how the works can be undertaken to minimise impacts to roads users, particularly during peak times.

Submission raised concerns about spoil haulage on Liverpool Road. Liverpool Road (Hume Highway) is an arterial road and an approved route for restricted access vehicles (heavy vehicles). It is therefore a suitable route for project-related heavy vehicles. Designated heavy vehicle routes for the project will be identified with consideration of potentially affected stakeholders. Routes and associated restrictions of use will be developed to minimise potential impacts and will be included in the CTAMP, which will be prepared in consultation with relevant transport stakeholders and local councils (refer to environmental management measure TT15 in **Chapter E1** (Environmental management measures)).

Construction traffic on Darley Road would see an increase on total traffic on Darley Road over the construction period (100 heavy and 70 light vehicles one way, per day). This would however only apply to a section of Darley Road that is approximately 200 metres in length, between the Darley Road civil and tunnel site and the Darley Road/James Street/City West Link intersection. While there would be an increase in traffic as a result of construction, construction traffic only represents a small increase over background traffic levels and therefore the overall effect of the construction traffic on the operation of the road network in this location is minor. This is demonstrated in section 7.4 of Appendix H (Technical working paper: Traffic and transport) of the EIS, which shows mid-block capacities on Darley Road would be consistent with existing LoS. Traffic controls would be put in place to manage construction traffic flows through this section of the road network.

The majority of construction traffic, including heavy vehicles, would access the Darley Road civil and tunnel site (C4) from the east, with the site ingress and egress points east of Charles Street/Canal Road. Direct impacts on Charles Street/Canal Road are therefore not anticipated. As shown in Table 7-19 of Appendix H (Technical working paper: Traffic and transport) of the EIS, the mid-block operational performance of Darley Road, west of James Street, would remain relatively stable at LoS C or LoS D, with a drop in performance only during the PM peak in the eastbound direction (LoS C 'without construction' to LoS D 'With construction'). The City West Link/James Street intersection is forecast to operate at LoS F in the 'Without construction' and 'With construction' scenarios in the AM and PM peak in 2021, indicating that even 'without construction' traffic, the performance of this intersection would be poor. Construction traffic is therefore unlikely to result in a significant change to the performance of this intersection and/or access to and from Charles Street/Canal Road during the peak periods.

A submission questions a potential increase in traffic on Booth Street, Camperdown as a result of motorists seeking to avoid congestion during construction activities and also general concerns regarding works in the vicinity of the Pyrmont Bridge Road tunnel site due to the urban density of suburbs, such as Camperdown. Reference is made to **section C8.4.2**, which discusses potential impacts related to drivers taking alternate routes. Project-related heavy vehicles will follow designated routes identified in the CTAMP that will avoid local roads. Trucks leaving the Pyrmont Bridge Road tunnel site would travel via Pyrmont Bridge Road and Parramatta Road. While they may traverse the intersection of Pyrmont Bridge Road and Booth Street, they would not travel through Booth Street. Spoil haulage trucks would travel along Parramatta Road in a westerly direction from this construction ancillary facility to the spoil management sites. This traffic would therefore move away from Camperdown and not through it.

Prior to construction, a CTAMP will be developed and implemented to manage the movement of vehicles to and from project sites and to ensure that vehicle movements operate in a manner that minimises impacts on local amenity, traffic flows and road safety. **Chapter E1** (Environmental management measures)) describes measures which have been designed to manage potential traffic and transport impacts resulting from the construction of the project. A truck management strategy (see environmental management measure TT16 in **Chapter E1** (Environmental management measures)) as part of the CTAMP will be developed for the project that:

- Identifies truck marshalling areas that can be used by project-related heavy vehicles
- Describes management measures for project-related heavy vehicles to avoid queuing and site-circling in local roads and other potential traffic and access disruptions
- Describes monitoring programs to demonstrate that project-related spoil haulage vehicles are complying with the strategy.

To reduce the impact of heavy vehicles queuing on local roads, an additional construction ancillary facility is proposed at White Bay on land owned by the Port Authority of NSW. See **section C8.2.2** and **Chapter D2** (White Bay civil site (C11)) for further information.

C8.4.2 Impact on roads due to drivers seeking to avoid construction areas

Submitters expressed concern that drivers seeking to avoid construction areas would use routes parallel to the project, exacerbating traffic congestion issues along these roads. Submitters raised the following specific issues and roads:

- Impacts of rat-running to avoid construction zones have not been considered
- Drivers will avoid Darley Road and will instead use nearby alternative roads such as Norton Street, Flood Street and William Street, which are already congested
- Rat-running in Haberfield, Annandale and Ashfield streets to avoid construction sites
- Rat-running on roads around Rozelle to avoid construction areas, including City West Link, Johnston Street, The Crescent, Catherine Street and Ross Street.

Response

Norton Street provides a north-south connection between City West Link and Parramatta Road at Leichhardt, while Darley Road also connects to east-west roads that provide a connection between City West Link and suburban areas to the west of the Hawthorne Canal. Due to the nature of traffic controls and calming devices on Norton Street, it is unlikely to represent an attractive alternative timesaving route. The LoS at the Norton Street and City West Link intersection is not anticipated to be impacted during the construction of the project. Regardless, the project construction traffic represents a minor relative increase compared to background traffic levels. This increase is unlikely to be the reason for an increase in rat-running.

Due to the proximity to the proposed construction ancillary facilities at Haberfield/Ashfield concentrated on Parramatta Road, there is limited opportunity for through traffic to utilise parallel routes around the sites of the construction ancillary facilities as they do not represent significant time saving routes. Similarly for the suburb of Annandale, construction activity is not expected to result in a significant increase in traffic on any local roads. In the development of the CTAMP for each site, construction traffic routes would be designated in consultation with local councils to confirm appropriate route selection. In regard to the travelling public and the potential to take alternative routes, while the traffic around construction ancillary facilities would be managed to the extent possible by the project, the project cannot control the behaviour of individual public drivers.

C8.5 Construction impact on public transport and emergency services

312 submitters have raised issues regarding impacts to public transport facilities and emergency services resulting from construction activities. Refer to section 8.3 of the EIS for details of potential construction traffic and transport impacts.

C8.5.1 Construction impact on public transport

Submitters raised general concerns relating to impacts to the public transport network, including longer travel times and reliability, changed transport routes and access to public transport facilities resulting from construction activities. Specific concerns included:

- The limited number of right turn accesses from the Balmain Peninsula to Victoria Road affecting public transport
- Bus routes and stops on Victoria Road and Parramatta Road will be impacted in the construction phase. Three bus stops located on Victoria Road will be relocated and this will impact on travel times
- Concern around removal of Buruwan Park at Annandale including:
  - Removal of the Rozelle Bay light rail stop
  - Loss of cycle and pedestrian access to the Rozelle Bay light rail stop, Rozelle Bay foreshore and the Sydney central business district (CBD) during construction
  - The creation of an 800 metre detour to the Rozelle Bay light rail stop - other alternatives should be explored
- Changes in access to light rail
- Public transport on Anzac Bridge and Victoria Road will be adversely affected
- Increased congestion could cause people to opt for public transport instead, which is already overcrowded. Request for details of the impacts on bus routes and stops within 500 metres of construction sites, including but not limited to Victoria Road
- Lack of detail for maintaining access, and safe access, to the Leichhardt light rail stop.
- Request that existing public transport capacity be maintained
- Concern about the impact the construction will have on the efficiency for bus users, bus connections to light rail, railway stations and Balmain ferries

- Concern that when the light rail service at the Leichhardt is not running, the substitute bus service stops at the exact location of the Darley Road mid-tunnelling site. This will add commuter bus traffic to Darley Road in addition to the construction traffic and ordinary traffic of the road and this extra traffic is not feasible.

Response

Buses

There would potentially be very minor increases in bus travel times due to slower travel speeds and increased intersection delays during construction. Such increases are however expected to be within the existing daily variation of travel times given that project construction traffic represents a very minor increase compared to background traffic volumes. This would be partially mitigated by the presence of existing bus lanes along Victoria Road at Rozelle and existing bus lanes along sections of Parramatta Road. Also, new bus lanes will be introduced on parts of Parramatta Road as part of the M4 East project (in accordance with condition of approval B34 for the M4 East project), which is likely to occur during the M4-M5 Lick construction period.

Longer travel times to and from bus stops by supplementary travel modes (eg car passenger, walking to/from bus stops) due to an increase in traffic volumes, slower travel speeds and increased intersection delays may also occur during construction.

The traffic assessment has identified eight bus stops that would require relocation during construction for passenger and worker safety reasons, comprising:

- The two bus stops on The Crescent (northbound and southbound) at Annandale near the intersection with City West Link would be moved south towards Johnston Street to allow for construction along The Crescent. The northbound bus stop would be permanently moved south to accommodate the new alignment. The southbound bus stop would be reinstated in about the same location. Alternative access from The Crescent to the Rozelle Bay light rail stop would also be provided during construction
- Three bus stops on Victoria Road (two on the northbound side and one on the southbound side) near the intersection with The Crescent would be relocated north to accommodate the reconstruction of Victoria Road. These bus stops would be reinstated in generally the same location at the completion of construction
- Two bus stops on Victoria Road near Iron Cove Bridge (one on the northern side and one on the southern side of Victoria Road) would be temporarily relocated (further east) to allow for the widening work along Victoria Road. These bus stops would be reinstated in generally the same location at the completion of construction
- The bus stop on Parramatta Road (eastbound) at the intersection of Mallet Street would be relocated east to accommodate the Pyrmont Bridge Road construction ancillary facility.

Bus users may also experience reduced amenity waiting at stops near construction ancillary facilities and other construction sites due to potential construction noise and dust impacts. Most bus stops on Parramatta Road would not be impacted by the construction of the project. The exception would be the bus stop on Parramatta Road at the intersection of Mallet Street, which may be relocated. This is forecast to have minimal impact to bus users.

Potential impacts on bus routes and bus stops during construction would be managed in consultation with Transport for NSW – Sydney Buses. Pedestrian access to bus stops, including disabled facilities, would be maintained during construction, where feasible. Where existing bus facilities cannot be maintained, temporary facilities or alternative stops would be provided. Temporary facilities would be constructed in consultation with Transport for NSW – Sydney Buses, TMC, affected bus operators and relevant local councils.

Rail services

The project would have no direct impact on heavy rail services. Bus service connections to railway stations may be affected due to a reduction in the reliability of bus services during the construction period, however these impacts are forecast to be minor and changes to access for buses to railway stations would be considered as part of the CTAMP that will be prepared for the project in consultation with relevant transport stakeholders.

Light rail

The Rozelle Bay light rail stop is not being removed as a result of the construction of the project. Access to the Rozelle Bay light rail stop would be maintained for the duration of construction. An 800 metre detour would not be required to access this light rail stop. Direct access to this light rail stop would be maintained from Bayview Crescent.

Pedestrian access to the Leichhardt North light rail stop adjacent to the Darley Road civil and tunnel site (C4) at Leichhardt and the Rozelle Bay light rail stop at Annandale would be maintained during construction. Physical separation of the worksite would ensure there is no interaction between the project and pedestrians accessing the light rail stop and therefore no potential for safety issues to arise. The project would have no direct impact on the operation of light rail services. There would be no impacts to light rail services as a result of the construction activities, including services at the Leichhardt North light rail stop.

Potential impacts on light rail stop access during construction would be managed in consultation with Transport for NSW. Existing pedestrian access to light rail, including disabled facilities, would be maintained during construction, where feasible. Where the existing light rail access cannot be maintained, temporary alternative access would be provided. Temporary access would be constructed in consultation with Transport for NSW.

Overall the project would not reduce the capacity of public transport to continue to service the areas around the project footprint.

C8.6 Construction impact on pedestrians and cyclists

2156 submitters have raised issues regarding the impacts to pedestrian and cyclists from construction traffic resulting from the project. Refer to section 8.3 of the EIS for details of potential construction traffic and transport impacts.

C8.6.1 Pedestrian and cyclist safety and connectivity during construction

Submitters have raised concerns relating to the potential impact of construction traffic on pedestrian safety and connectivity. Specific concerns include:

- Impacts on the safety of schoolchildren walking or riding to school, (including at Rozelle Public School, Dobroyd Point Public School, Leichhardt Secondary College and Bridge Road School), elderly residents and people walking and jogging for recreation
- Safety concerns for pedestrians (including schoolchildren) around the Darley Road civil and tunnel site, Option B, Haberfield civil site and Parramatta Road civil and tunnel site (including the Muirs site), as trucks will use the same routes that pedestrians access local schools and additional parking spaces taken up by non-local traffic
- Diverting arterial traffic from Darley Road down local streets will create safety issues
- Concern about pedestrian safety at St Columba's Catholic Primary School on-road rear to kerb parking on the eastern side of Elswick Street during school drop-off and pick-up times
- Concern for pedestrian safety due to rat-running on local roads around construction sites
- Pedestrian access to nearby areas of public open space and the need to manage pedestrian activity in the area
- Requests for more detail about construction impacts on footpaths and cycle paths within 500 metres of construction at Victoria Road at Rozelle
- Detours for pedestrians and cyclists as a result of construction works
- Concern about the parking upgrade at King George Park which may result in an increase in demand for on-street parking in nearby streets during construction, with subsequent potential impacts on pedestrians
- The use of construction and workforce vehicles in and around King George Park, including for the construction of the Iron Cove Link, may impact the safety of pedestrians. Main concerns included:
  - Callan Street, Springside Street and McCleer Street are all shared zones and would become major access roads to the park during construction which may create a safety issue

  - Endangering pedestrians and cyclists during construction due to road arrangements and close proximity of construction activities to normal traffic
  - Endangering parents and small children who walk to school due to: road closures, heavy construction vehicles, and driver rat-runs
  - Endangering children traveling to and participating in important school events held at King George Park
- Proposed closures of Bland Street and Alt Street at Haberfield will affect pedestrian routes and safety to and from Haberfield Public School. The crossing from the Ashfield side of Bland Street to access Haberfield Public School will be unsafe due to construction vehicles
- Impacts on pedestrians around the shared zones of Callan Street, Springside Street and McCleer Street at Rozelle
- Construction would impact on the dedicated bicycle paths of the Bay Run
- The removal of Buruwan Park would impact on cyclists, as there is a major cycle route through the park
- Construction at Darley Road would make it hazardous to cross the road and access the light rail, Blackmore Park, the Bay Run and Leichhardt Pool
- The construction of the water treatment plant and substation at the Darley Road site will prevent direct pedestrian access to the light rail stop
- Concern that by removing the crossing in front of the Darley Road site, wheel chair/mobility scooter bound people would not be able to safely access the light rail as the top of Darley Road is too steep
- The Darley Road civil and tunnel site may impact pedestrians, due to trucks entering directly from City West Link and the right hand turn from James Street into City West Link
- Request for a footbridge to be implemented in the construction phase around Victoria Road to assist in safe pedestrian access
- The EIS provides no assurances that current pedestrian crossings across Victoria Road between Toelle Street and Terry Street and Moodie Street and Terry Street will be preserved. Safe and convenient alternatives should be found both during and after construction
- Submitters oppose the removal of pedestrian overpasses near the intersection of Victoria Road, The Crescent and the Western Distributor. The alternative route provided is long, circuitous and potentially unsafe. Pedestrians to the bus stop opposite Lilyfield Road will have to divert. down Gordon Street, under Victoria Road and then climb back up the grade to the bus stop on Victoria Road, a much greater distance to walk
- People with mobility impairments will be especially disadvantaged by access changes during construction
- The EIS does not identify how the existing bicycle lanes will be maintained during construction
- Request that existing active transport capacity be maintained and not minimised of impacts
- Concern of pedestrian safety due to rat-running through streets such as Hubert, Charles and William streets at Leichhardt and near the shopping centre at Annandale
- Concern about the proposed spoil route along Liverpool Road through Ashfield shopping centre as this would have a negative impact on pedestrian road safety
- Concern about the safety of pedestrians accessing the buses near the Camperdown dive site due to construction traffic movements
- Concern for pedestrian and cyclist safety surrounding all construction sites with further concerns that a promise of a plan is an inadequate answer to pedestrian and cyclist safety impacts
- Concern about pedestrian safety due to an increase in construction vehicles in Leichhardt, particularly pedestrians accessing Leichhardt North light rail stop, Orange Grove Public School and Leichhardt Secondary College.

Response

Pedestrian and cyclist access and connectivity would be maintained where possible, throughout the construction phase. Where it would not be feasible to use existing routes, alternative routes would be provided and communicated to the community. Pedestrian and cyclist movements around construction ancillary facilities would be managed in accordance with a CTAMP (see **Chapter E1** (Environmental management measures)). The CTAMP will include measures to ensure pedestrian and cyclist safety is maintained during construction.

The general principles that would be used to develop alternative pedestrian and cyclist footpaths and routes during construction would include consideration of the following:

- Impact of construction works on existing pedestrian and cyclist connections
- Volume of pedestrians/cyclists
- Type of pedestrian and cyclist activity, whether office, retail, residential, school or recreational
- Pedestrian and cycle desire lines/travel paths
- Needs of vulnerable pedestrians, such as children, the elderly and disabled people
- Proximity of pedestrian and cycle-generating developments, such as schools, shopping centres, bus stops/layovers.

This includes selecting construction ancillary facility access and exit points which minimise interaction with pedestrian routes used by school children. Specific arrangements would be included in the CTAMP to separate school children from the construction sites including the identification of safe drop-off and pick-up zones. This would include providing alternative pathways around construction ancillary facilities for pedestrian traffic to access the schools. These would be developed in consultation with the school. Potential safety impacts to school children, including at Rozelle Public School and Bridge Road School, are described in Appendix P (Technical working paper: Social and economic) of the EIS. It is intended that construction works would not impact on the capacity of the existing active transport system.

In regard to safety, the construction traffic represents a relatively small increase in traffic compared to background numbers. Therefore, the project is unlikely to represent a significantly different safety risk above the existing situation. Furthermore the majority of kilometres travelled by construction vehicles would be on the arterial and motorway network which is generally not used by pedestrian or cycle traffic limiting the potential for interactions vehicular traffic.

The sections below summarise the predicted impacts from construction traffic and movement of spoil on the roads surrounding each construction ancillary facility sites. Opportunities to use the M4 East and New M5 tunnels for spoil haulage would be considered at detailed design to reduce impacts on the surface road network.

Haberfield – Option A

There are limited changes to the surface network proposed around the Wattle Street interchange. This combined with relatively limited use of the interchange by cyclists due to it not being part of key commuter cycle routes and no required diversions would mean that impacts on active transport would be negligible including to active transport commuters accessing Haberfield Public School.

Based on community feedback and concerns raised in submissions on the EIS, a number of refinements to the construction ancillary facilities at Haberfield and Ashfield have been made to further minimise impacts on the community and sensitive receivers. This includes:

- Wattle Street civil and tunnel site – the area at the surface currently being used as a construction zone for the M4 East project would no longer be used. Construction activities would be limited to the Wattle Street entry and exit ramps
- Haberfield civil site – footprint reduced and site to be used as a civil site only as per the arrangement for the Haberfield civil site (C2b). The C2a option would therefore not be used for the construction of the project. No tunnelling from this site is proposed.

Parramatta Road West civil and tunnel site (C1b)

There are no planned diversions to pedestrian footways and cycling paths during construction. Periodic, short-term closures of footpaths on both sides of Alt Street on the eastern and western sides of Parramatta Road may be required. These would be most likely to occur during site establishment, when access to this site is being established. Where a footpath is temporarily closed, the corresponding footpath on the other side of the road would remain open.

While the volume of vehicles forecast to use these is low, minor impacts are anticipated during construction as, while no diversions are required, there may be a safety impact. Traffic management measures would be implemented at the entry and exit driveways on Parramatta Road, Alt Street and Bland Street to manage potential interactions between construction traffic and pedestrians and cyclists.

Haberfield civil site (C2b)

The Haberfield civil site would be located above and below ground around the south-eastern corner of the Parramatta Road and Wattle Street intersection. This construction ancillary facility would use land above ground that is currently being used as a construction ancillary facility for the M4 East project. Should this site be used it would mean that any changes to the active transport arrangements that are currently in place would likely be continued for the duration of the use of this site with minimal additional changes required.

Parramatta Road East civil site (C3b)

There are no planned diversions to pedestrian footways and cycling paths during construction. Periodic, short-term closures of footpaths on both sides of Alt Street on the eastern and western sides of Parramatta Road may be required. These would be most likely to occur during site establishment, when access to this site is being established. Where a footpath is temporarily closed, the corresponding footpath on the other side of the road would remain open.

While the volume of vehicles forecast to use these is low, minor impacts are anticipated during construction as, while no diversions are required, there may be a safety impact. Traffic management measures would be implemented at the entry and exit driveways on Parramatta Road, Alt Street and Bland Street to manage potential interactions between construction traffic and pedestrians and cyclists.

Darley Road civil and tunnel site (C4)

The temporary closure of the footpath on the northern side of Darley Road at Leichhardt, between around Canal Road and Darley Road, may be required. This would be most likely during site establishment. The footpath along the southern side of Darley Road would remain open at all times, and would act as an alternative to the northern footpath during temporary closures. Measures will be put in place to ensure that alternative pathways meet the requirements of people who have mobility impairments.

The on-road cyclist route on Darley Road at Leichhardt that connects to the Lilyfield Road commuter route via the City West Link/James Street intersection would require traffic management measures at the entry and exit driveways of the site to manage potential interactions between construction traffic and pedestrians and cyclists.

The project would not affect the existing pedestrian path that runs along the southern side of City West Link and connects the Leichhardt North light rail stop with Charles Street at Lilyfield (via the bridge over City West Link). Nor would the project affect existing active transport links or generate additional safety issues in relation to St Columba's Catholic Primary School, Orange Grove Public School or the Leichhardt Secondary Collage. The project would not generate any construction traffic directly adjacent to any of these schools. Any construction worker parking that may use roads adjacent to these schools would be managed through car parking strategies that would be prepared by the design and construction contractor(s) and the form and content would be developed specifically for this project and its construction ancillary facilities (see environmental management measure TT04 in **Chapter E1** (Environmental management measures)).

Rozelle civil and tunnel site (C5), The Crescent civil site (C6) and Victoria Road civil site (C7)

Key regional active transport routes pass through the Rozelle interchange area. These include the Lilyfield Road to Anzac Bridge (east–west) route and Johnston Street to Victoria Road and Anzac Bridge route. Construction activities associated with the Rozelle interchange would result in temporary diversions of these routes.

The Victoria Road pedestrian bridge would be demolished and removed at the start of construction. Prior to this occurring, an alternative connection to the western side of Victoria Road and the Lilyfield Road commuter route would be established via an underpass below Victoria Road into the Rozelle Rail Yards, and a ramp connection to Victoria Road and Lilyfield Road. This underpass would enable east-west trips to continue and it is anticipated that it will be converted into a portion of the permanent connection at the completion of construction. Although this would mean a permanent change to the alignment of this route, the impact of this alignment change would be negligible as the distance of the route would be similar and the quality of the connection would be equivalent to the existing route.

Temporary realignment of the section of this connection between Anzac Bridge and the western side of Victoria Road may also be required. Connections to the shared path on either side of Victoria Road would be retained. Temporary closures of the shared path along Victoria Road may be periodically required. Works would be staged so that the shared path on either the eastern or western side of Victoria Road at Rozelle would remain open at all times.

The footpath and cycle bridge that spans City West Link and connects Anzac Bridge and Victoria Road with The Crescent and Johnston Street would be removed at the start of construction. Potential alternatives and diversions being considered for implementation include:

- The existing at-grade crossing between The Crescent and the western side of Victoria Road. This route would also allow for onward connection to the eastern side of Victoria Road and Anzac Bridge via the new pedestrian and cyclist underpass that would be provided below Victoria Road (see description of this underpass above). The diversion would be less than 200 metres and there would be negligible safety impact. However, there could be a minor increase in travel times due to delays waiting for the traffic signals to change. The impact of this change would therefore be minor
- From Anzac Bridge to Sommerville Road at Rozelle via the existing pedestrian and cycle ramp, then southwest along Sommerville Road and James Craig Road (using the shared path) towards the footpath on the southern side of The Crescent. This would result in a similar travel distance to the current route and would be a negligible impact.

Periodic, short-term closures of the footpath on one side of James Craig Road at Rozelle may be required during construction. During these instances, the footpath on the other side of James Craig Road would be used as an alternative route with alternative crossing points provided with appropriate signage to direct pedestrians and cyclists to safe crossing points. Periodic, temporary closures of the footpath on the eastern and western side of The Crescent at Annandale between City West Link and Johnston Street at Annandale would also be required during construction. Works would be staged so that the shared path on one side of The Crescent would remain open at all times.

The project would also require permanent closure of the shared path through Buruwan Park connecting The Crescent with Bayview Crescent at Annandale (refer to Table 8-9 of the EIS). Alternative access for pedestrians to the Rozelle Bay light rail stop from The Crescent, Johnston Street and Bayview Crescent at Annandale would be provided at all times during construction. Cyclists travelling between The Crescent and Bayview Crescent/Railway Parade at Annandale would be diverted via Johnston Street. No changes to active transport connection to either the Rozelle Public School or Bridge Road School would occur.

Iron Cove Link civil site (C8)

The key pedestrian and cycle route in this area connects Iron Cove Bridge shared path (on the southern side of Victoria Road), the shared paths on either side of Victoria Road and the Bay Run south of Victoria Road, which extends around Iron Cove.

A detour route would be provided for cyclists on the southern side of Victoria Road via Springside, McCleer, Callan, Manning and Byrnes streets. This would represent a travel distance of about 700 metres, 400 metres longer than the existing 300 metre section along Victoria Road. Given the length of the diversion and the corresponding increase in travel times for pedestrians and cyclists, the impact is considered to be moderate. Temporary shared paths to be installed during construction would be provided with appropriate separation distances and/or structures from construction activities and live traffic to prevent conflict, which could result in safety concerns.

A temporary link would be provided that would connect the Bay Run and Iron Cove Bridge. To minimise potential disruption to pedestrians and cyclists that use this link, a temporary ramp to Iron Cove Bridge shared path would be provided, to connect the Bay Run and Iron Cove Bridge (westbound) and Byrnes Street (eastbound, to connect with the diversion described above). This temporary diversion would not change the distance or travel times for users of the Bay Run and Iron Cove Bridge and would not result in additional safety impacts, and would therefore have a negligible impact.

Streets such as Callan Street, Springside Street and McCleer Street, which have shared zones, would continue to operate as such. With the exception of the site establishment phase, light and heavy constructions vehicles would generally access the Iron Cove Link civil site from Victoria Road.

Pyrmont Bridge Road tunnel site (C9)

The Inner City Regional Bicycle Network for cyclists runs along Pyrmont Bridge Road at this location (identified as a 'bicycle friendly road') with connections via Parramatta Road (west) and Booth Street (northern continuation of Mallett Street). There are pedestrian footpaths on both sides of Parramatta Road and Pyrmont Bridge Road.

Minor impact is anticipated for pedestrians and cyclists at this location. Although there would be no requirement for diversions, there is the potential for interactions with construction vehicles, particularly where heavy vehicles enter the site from Parramatta Road and exit the site on to Pyrmont Bridge Road. Traffic management measures would be implemented at the entry and exit driveways on Parramatta Road and Pyrmont Bridge Road to manage potential interactions between construction traffic and pedestrians and cyclists. There would be no access issues in relation to access to Dobroyd Point Public School.

Campbell Road civil and tunnel site (C10)

Campbell Road at St Peters is currently used as a local route by cyclists due to low traffic volumes. The New M5 project would upgrade Campbell Road, with a forecast increase in traffic volumes. Delivery of the New M5 project would also include construction of a separated cycle path along Campbell Road (forming part of the Bourke Street Link), connecting Newtown to the Bourke Street Cycleway, Green Square and the Sydney CBD.

For pedestrians and cyclists using the new separated cycle path along Campbell Road, there would be the potential for interactions with construction vehicles entering and leaving the Campbell Road civil and tunnel site (C10). However, as part of the New M5 project, the Campbell Road/Albert Street intersection would be upgraded to a signalised intersection to cater for M4-M5 Link construction traffic entering and leaving the site. This signalised intersection would provide signalised crossing for pedestrians and cyclists using the new pedestrian and cyclist paths along the southern side of Campbell Road. No diversions would be required. The impact on pedestrians and cyclists at this location would therefore be negligible.

C8.6.2 Submissions supporting the EIS

Submitter is pleased with the plan to providing an alternative pedestrian/cyclist route before the demolition of the Victoria Road overpass.

Response

The submissions support is noted. The project seeks to ensure that impacts to pedestrian and cycle infrastructure will be offset through the provisions of alternative routes prior to the impact occurring. Changes to pedestrian and cycle conditions will be communicated to the public prior to impacts occurring.

C8.7 Traffic safety during construction

1291 submitters have raised concern about a decrease in vehicular traffic safety within the project footprint. Refer to section 8.3 of the EIS for details of potential construction traffic and transport impacts.

C8.7.1 Increased risk of traffic incidents during construction

Submitters have raised concerns about an increased risk of traffic accidents occurring during the construction of the project because of the increased presence of heavy construction vehicles and temporary road network changes to existing transport infrastructure (ie closures, diversions, changes to lanes, changes to traffic signage). Specific issues raised include:

- The proposal to run trucks close to homes on Darley Road is dangerous
- The two fatalities which occurred near the proposed Darley Road civil and tunnel site are evidence of the risk of increased traffic incidents. Introduction of an additional 170 vehicle movements a day to a known accident blackspot is unacceptable. The proposal for construction trucks to make a right-hand turn into James Street from City West Link will increase traffic accident risks
- Traffic lanes on the southern side of Darley Road would be relocated onto the existing parking lane which is unsafe for vehicular traffic
- Diverting arterial traffic from Darley Road down local streets will create safety issues
- Construction trucks travelling on the southern side of Darley Road will force traffic onto the existing parking lane which is geometrically unsuitable and unsafe for vehicular traffic
- Concern the access arrangement for the Darley Road site will create traffic conflict at the shared entry/exit driveway near Hubert Street
- Concern about the safety risk to the homes near the Darley Road civil and tunnel site due to the truck access proximity to homes
- Submitters raised concerns that the increase in construction traffic (including from the use of Option B) so close to Haberfield Public School poses a safety risk for children who are driven to and from school. Temporary traffic closures of one lane of Alt Street and Bland Street for construction vehicle access will have unacceptable safety impacts as these streets are the main access route to and from Haberfield Public School
- The use of construction and workforce vehicles in and around King George Park, including for the construction of the Iron Cove Link, may impact the vehicle safety. Main concerns included:
  - Callan, Springside and McCleer streets would become major access roads to the park during construction which may create a safety issue
  - Endangering road users during construction due to road arrangements and close proximity of construction activities to normal traffic
  - Endangering children traveling to and participating in important school events held at King George Park
- Impact of construction traffic on the vehicular safety of narrow local roads, such as Elswick Street
- Increase in traffic accidents due to rat-running in local streets to avoid congestion caused by construction traffic
- Increased risk of traffic incidents at Johnston Street
- Objection to 68-72 Lilyfield Road, Rozelle being used as a parking site for the project. The site has a high number of vehicle crash statistics compared to the Sydney metropolitan rate
- Road safety would be at risk due to the truck movements on Norton Street, this curved, sloping suburban street and its surrounds
- Concern that the removal of trees will cause more accidents as the sun will blind drivers more regularly.

Response

Construction traffic routes to and from construction ancillary facilities are generally along arterial roads (such as City West Link, Wattle Street, Victoria Road, Parramatta Road and the Princes Highway) and motorways. The contribution of construction-related heavy and light vehicle traffic would be very small compared to existing background traffic flows along the majority of construction haulage routes. For example, construction traffic through City West Link during its peak would result in an additional vehicle every 3.5 minutes, which is unlikely to have an impact on the safety of this roadway. Therefore the potential for construction traffic to significantly increase the likelihood of incidents is very low.

The potential for vehicle incidents to occur during construction as a result of heavy vehicles using the road network would be managed via the implementation of environmental management measures described in **Chapter E1** (Environmental management measures). These would include:

- A CTAMP will be prepared as part of the Construction Environmental Management Plan. It will include the guidelines, general requirements and principles of traffic management to be implemented during construction, including:
  - Signage requirements (eg temporary speed restrictions, changes to the road environment, traffic management controls)
  - Lane possession and approval process during periods of online construction (eg linemarking and temporary barriers)
  - Traffic control devices such as traffic signals or manual traffic controllers which do not have signals
  - A local and regional communications strategy, including methods to provide advanced notice of any major or prolonged impacts (eg leaflets and local media), and real-time information regarding current impacts (eg variable message signs, radio traffic news)
  - Details of both the general approach to be used for access and egress to construction ancillary facilities and the specific controls required at specific locations
  - Where possible, construction traffic would avoid narrow streets or lanes with heavy vehicle traffic using the arterial road network wherever possible. Note that no heavy vehicle traffic is proposed along Elswick Street, Leichhardt. If heavy vehicle traffic on local roads cannot be avoided, traffic control measures including signage and speed zones may be enforced to manage any safety issues
  - Specific provisions required to manage potential impacts to sensitive receivers, such as schools (including Haberfield Public School, Bridge Road Public School and Rozelle Public School), child care centres and health facilities (see environmental management measure TT15 in **Chapter E1** (Environmental management measures))
- The CTAMP would be prepared in accordance with Austroads *Guide to Road Design* (with appropriate Roads and Maritime supplements), *Traffic Control at Work Sites* (RTA 2010) and AS 1742.3: Manual of uniform traffic control devices – Part 3:Traffic control for work on roads. Traffic controls would be established in accordance with the latest standards and if necessary additional control may be required in order to address any pre-existing safety matters, for example black spots, that may be in place within the impacted road network
- A truck management strategy would be prepared with subsequent monitoring programs to demonstrate that project-related heavy vehicles are complying with the strategy (see environmental management measure TT16 in **Chapter E1** (Environmental management measures)).

The CTAMP to be prepared for the project will include provisions to ensure that construction vehicle drivers are made aware of designated routes, posted speed limits and any access and route restrictions, and regular traffic safety updates would be held with all construction personnel via project inductions and toolbox talks.

The Parramatta Road West civil and tunnel site (C1b) has a proposed heavy and light vehicle cross-over on Alt Street and the Parramatta Road East civil site (3b) has proposed light vehicle entries and exits on Alt Street and Bland Street. Bland Street is an existing local cycle route and, although this section of Alt Street is not a designated on-road cycle route, cycle logos are painted on Alt Street close to Parramatta Road.

Traffic management measures would be implemented at the entry and exit driveways on Parramatta Road, Alt Street and Bland Street to manage potential interactions between construction traffic and other motorists, pedestrians and cyclists.

Norton Street is not proposed as a spoil haulage route and would be avoided as a designated route for other project-related heavy vehicles.

There is no evidence that relates tree removal and worsening road safety.

The use of the Rozelle Rail Yards for parking would not impact on network traffic safety.

Project-related vehicles would need to use local roads in the vicinity of the Iron Cove Link civil site (C8) during site establishment due to the absence of parking on Victoria Road in the vicinity. All traffic would be required to adhere to shared zone requirements. When the Iron Cove Link civil site (C8) has been established it would generally be accessed directly from Victoria Road with minimal heavy vehicles usage of local roads in the vicinity. Due to the closure of some local roads during construction, minor increases in traffic on adjoining streets may occur however this traffic would still be subject to the posted speeds and shared zone traffic calming measures. As a result, a worsening safety situation in this area is not expected during construction. Similarly this is not expected to result in safety impacts on children who may be accessing King George Park as part of school activities.

Darley Road

Consultation with the community and key stakeholders on the concept design for the M4-M5 Link has been carried out prior to and during the exhibition of the EIS. This feedback has highlighted concerns with the use of the Darley Road civil and tunnel site (C4) during construction in the configuration presented in the EIS. Concerns included:

- The use of Darley Road by construction traffic (in particular trucks) and associated impacts, including:
  - Impacts on the performance of the road network, including the City West Link/James Street/Darley Road intersection
  - Safety impacts on other motorists and pedestrians
  - Changes to access, including *Disability Discrimination Act 1992* (Commonwealth) (DDA) compliant access, to nearby amenities including the Leichhardt North light rail stop
- Noise impacts on nearby receivers from construction traffic and construction activities occurring within the site.

Refinement of the design at the Darley Road civil and tunnel site (C4) has been undertaken in response to the concerns outlined above and would involve:

- Changes to the haulage route for incoming construction traffic. Heavy vehicles would travel eastbound along City West Link, use James Craig Road to circle back to City West Link (westbound) and use the existing left turn into James Street. As a result, the proposed right turn arrangement from City West Link into Darley Road would be removed. The forecast volume of heavy construction vehicles attending the Darley Road site is expected have a peak arrival and departure rate of seven vehicles per hour. City West Link is expected to be carrying approximately 2000 vehicles per hour of general traffic in each direction. The construction traffic on City West Link and through its intersection with James Street is likely to be about one additional vehicle every four minutes. This is not expected to materially affect the safety of the intersection
- Establishment of a dedicated right turn bay for heavy vehicles to enter the site from the existing westbound carriageway of Darley Road. A temporary, additional lane on the southern side of Darley Road would be established to maintain westbound traffic movements.

All traffic arrangements and temporary traffic controls would be designed in accordance with AustRoads and Roads and Maritime standards. Adequate, safe separation of vehicles from properties in Darley Road will therefore be maintained.

The design would provide opportunities to reduce potential traffic and noise impacts while minimising the physical changes required to the EIS design. See **section C4.18.1** for further information.

In addition, the White Bay civil site (C11) is now proposed and would provide the project with about 50 additional light vehicle parking spaces in addition to providing a heavy vehicle marshalling capability. This would further reduce demand on on-street parking. Further discussion on the White Bay civil site (C11) is presented in **Chapter D2** (White Bay civil site (C11)).

C8.8 Construction impacts to parking

1,041 submitters have raised issues regarding the performance of the road network during operation. Refer to section 8.3 of the EIS for details of potential construction traffic and transport impacts.

C8.8.1 Loss of parking due to construction workers

Submitters have raised concerns about loss of existing parking around the construction ancillary facilities and the construction sites due to construction workers parking in public areas. These concerns include:

- The EIS contains a provision for parking for only 12 of the around 100 workers at the Darley Road civil and tunnel site. A major construction site should provide sufficient allocated parking for all workers. Parking areas at Hubert Street and Darley Road are already at capacity due to the proximity to the Leichhardt North light rail stop. With the addition of construction workers, available parking spots will be more difficult to find
- General loss of parking due to construction workers parking on local streets
- The EIS proposes the removal of 20 car spaces and the kiss and ride parking facility for the light rail stop near the Darley Road civil and tunnel site (C4). This will result in residents being unable to park on their own streets
- There are no proposed worker parking spaces at The Crescent civil site or the Pyrmont Bridge Road civil site
- The dedicated 400 construction worker car spaces at Rozelle civil and tunnel site (C5) is not sufficient to cater for the forecast 550 workers at the site each day, leaving potential short fall for 150 additional vehicles finding parking on residential streets during construction. Parking is already constrained on the local streets in this area by light rail commuters
- Request for designated construction worker parking areas to be developed, so workers do not park on residential parking areas
- Whether residential parking permits would be implemented or parking meters installed
- Request for a commitment of parking availability for residents
- Object to the removal of kerbside parking in Alt Street
- All streets abutting Darley Road (James Street to Falls Street), should have strict prohibition on any worker contractor parking as this area already provides insufficient parking for residents.
- Concerned about the impacts of parking loss surrounding the civil and tunnel site at Darley Road, Leichhardt due to contracted workers
- Concerned by the loss of additional parking spaces by non-local traffic during school pickup/drop off at Haberfield Public School
- Concerned about construction worker parking adversely impacting residents in Charles Street, Hubert Street, Darley Road and Francis Street near the Darley Road civil and tunnel site.

Response

The majority of the construction ancillary facilities nominated for the project would have parking provision for construction workers. However, this would not meet the full needs for construction workforce parking expected to be generated by the project. It is anticipated that construction workforce parking would be primarily provided at the following sites:

- Northcote Street civil site (C3a) – around 150 car parking spaces (Option A)
- Parramatta Road East civil site (C3b) – around 140 car parking spaces (Option B)
- Rozelle civil and tunnel site (C5) – around 400 car parking spaces
- Campbell Road civil and tunnel site (C10) – around 150 car parking spaces.

To reduce the impact of heavy vehicle queuing on local roads, an additional construction ancillary facility is proposed at White Bay on land owned by the Port Authority of NSW. The provision of this site, the White Bay civil site (C11) would provide additional construction workforce parking spaces (around 50 spaces).

To make use of the parking availability at these facilities, shuttle bus transfers would be provided to transport workers to other sites that do not have spare parking capacity. This would alleviate parking demand at other sites and further reduce parking impacts identified in the EIS.

The construction workforce would be encouraged to use public transport and carpool thereby reducing the demand for worker parking. Victoria Road and Parramatta Road are major transport corridors that have multiple bus routes. The Inner West Light Rail Line runs along the southern side of City West Link with stops near the Rozelle Rail Yards at Rozelle Bay and Lilyfield and at the Darley Road civil and tunnel site (Leichhardt North light rail stop). However, workers starting or ending shifts very early or very late would be more likely to use private vehicles.

Light vehicle parking will be provided within the construction ancillary facility at The Crescent civil site (C6) and the Pyrmont Bridge Road tunnel site (C9). Typically, these sites would provide between four to 20 parking spaces intended to be used by engineers and other construction management staff. Parking of construction-related vehicles in adjacent local roads would occur, particularly during site establishment. The project would not remove parking in Alt Street or Bland Street at Ashfield during construction. The project is not proposing any changes to the established resident parking permit system. This is a matter for local councils.

Prior to construction commencement, a car parking strategy would be developed to describe how parking impacts in adjacent areas would be minimised (see environmental management measure TT04 in **Chapter E1** (Environmental management measures)). The strategy will be developed as part of the CTAMP in consultation with local councils, as well as with the M4 East and New M5 project contractors to identify opportunities to use parking being used during their respective construction periods.

The car parking strategy will include items such as forecasting of construction parking demand, review of existing parking supply and use of local streets in the area, impact on existing parking, consultation activities and proposed mitigation measures, such as:

- Quantify construction workforce parking demand around project work sites and ancillary facilities during site establishment and the construction phase generally
- Identify public transport options and other management measures (such as carpooling and shuttle buses) to reduce construction workforce parking demand
- Identify all locations that will be used for construction workforce parking
- Identify potential offsite areas that could be used for construction workforce parking that would be investigated and secured for use during construction where required and possible
- Identify parking exclusion zones, in consultation with potentially affected stakeholders, around construction sites and facilities where construction workforce parking would be restricted.

C8.8.2 Temporary loss of parking due to construction work

Submitters have raised concerns about the loss of existing parking spaces by the project during construction. Concerns include:

- Loss of parking during construction on Lilyfield Road or near Easton Park
- The bioretention basin at King George Park will negatively impact resident parking opportunities. Concern about the parking upgrade at King George Park and reduction of the number of car parks from 80 to 30 spaces, which will force additional 50 cars to park in adjacent shared zones
- Concern about loss of 20 residential on-street car parks in Darley Road due to works.

Response

Changes to parking accessibility as a result of the project due to road modifications are listed in **Table C8-2**.

Table C8-2 Indicative temporary road network modifications during construction

Location	Indicative road network modifications	Indicative duration	Road reinstatement
Option A			
Wattle Street interchange	• Northcote Street would be closed at the intersection with Parramatta Road for the duration of construction. This would be a continuation of the current closure of this section of Northcote Street to facilitate construction of the M4 East project. Current parking impacts would therefore remain the same.	• Until completion of tunnel works in 2022.	Once construction is complete, the Northcote Street/Parramatta Road intersection would be reinstated.
Darley Road civil and tunnel site (C4)	• Temporary diversions along Darley Road may be required during construction (to enable establishment of construction vehicle access provisions). • One lane in each direction along Darley Road (between around Francis Street and Charles Street at Leichhardt) would generally be maintained. Kerbside parking along the northern (eastbound) carriageway of Darley Road between around Francis Street and Charles Street would be removed (around 20 spaces) during construction.	• Q3 2018 to Q1 2019 to complete road modifications • Q3 2018 to Q4 2022 including construction duration and reinstatement of roads.	Once road modification works are complete, Darley Road would be reopened in line with temporary design. When construction is complete, the road would be reinstated as per the existing arrangement. Kerbside parking along Darley Road would be reinstated at the end of construction.
City West Link and The Crescent at Lilyfield and Rozelle	• Works would be carried out to upgrade and improve the eastbound and westbound carriageways of City West Link and The Crescent. • Under existing and diverted arrangements, all traffic lanes in each direction would generally be maintained with some short-term lane closures (outside of peak periods where feasible and reasonable) subject to road occupancy licences. • There is no kerbside parking that would be impacted on the relevant sections of City West Link or The Crescent.	• Q4 2018 to Q2 2019 to complete road modifications. • Q4 2018 to Q3 2023 including construction duration staging, temporary roads and reinstatement of roads.	When construction is complete, the road would be reinstated as per the permanent design shown in Chapter 5 (Project description) of the EIS.

Location	Indicative road network modifications	Indicative duration	Road reinstatement
The Crescent at Annandale and Rozelle	• Works would be carried out to establish a new driveway for ingress and egress for The Crescent civil site (C6) • There would be no impacts to kerbside parking.	• Q4 2018 to Q2 2019 to complete road modifications • Q4 2018 to Q3 2023 including construction duration staging, temporary roads and reinstatement of roads.	Once road modification works are complete, the road would be reopened in line with the temporary design. When construction is complete, the road would be reinstated as per the permanent design.
Victoria Road at Rozelle	• All traffic lanes in each direction would generally be maintained with some short-term lane closures (outside of peak periods where feasible and reasonable) subject to road occupancy licences • Temporary diversions would be put in place at the intersection with The Crescent to allow for construction of the new bridge in line with the permanent design. This could include the construction a temporary bridge next to the existing bridge, onto which traffic would be switched during construction of the new bridge. When complete, traffic would be switched onto the new bridge and the temporary bridge would be removed • Victoria Road includes a combination of clearways and bus lanes in the outermost lane meaning no kerbside parking is currently available.	• Q4 2018 to Q2 2019 to complete road modifications • Q4 2018 to Q3 2023 including construction duration staging, temporary roads and reinstatement of roads.	Once road modification works are complete, the road would be reopened in line with the temporary design. When construction is complete, the road would be reinstated as per the permanent design.
Gordon Street south of Lilyfield Road at Rozelle	• Gordon Street between Lilyfield Road and the Rozelle Rail Yards would be permanently closed as part of the project • On-street parking would therefore be lost from this section of Gordon Street.	• N/A	Gordon Street would be permanently closed.

Location	Indicative road network modifications	Indicative duration	Road reinstatement
Lilyfield Road at Rozelle	• Temporary closures to one lane would be required for short periods of time to allow for construction of the construction access driveways, utility works and construction of the cut-and-cover structures • Access to Lilyfield Road from Victoria Road may be temporarily restricted to allow for integration with the revised Victoria Road alignment. Closures would be outside of peak periods where feasible and reasonable. During these periods, alternative access to Lilyfield Road would be available from Hornsey Street and Gordon Street • Some temporary loss of parking may occur to maintain trafficable road widths during lane closures.	• Q4 2018 to Q2 2019 to complete road modifications • Q2 2019 to Q4 2019 for utility relocations • Q4 2018 to Q3 2023 including construction duration staging and reinstatement of roads.	Once works are completed, the road would be reopened in line with the permanent design.
Hornsey Street at Rozelle	• One lane in each direction would generally be maintained during construction • Access to Hornsey Street from Victoria Road would require full closure for short periods of time during realignment and upgrade works to Victoria Road • Alternative access to Hornsey Street would be available from Lilyfield Road and Gordon Street • Some temporary loss of parking may occur to maintain trafficable road widths during lane closures.	• Q4 2018 to Q2 2019 to complete road modification • Q4 2018 to Q3 2023 including construction duration staging and reinstatement of roads.	Once works during this stage are completed, the road would be reopened in line with the permanent design.
Quirk Street at Rozelle	• One lane in each direction would generally be maintained during construction • Access to Quirk Street from Victoria Road would require full closure for short periods of time during realignment and upgrade works to Victoria Road • Alternative access to Quirk Street would be available from Hornsey Street and Gordon Street.	• Q4 2018 to Q2 2019 to complete road modifications • Q4 2018 to Q3 2023 including construction duration staging and reinstatement of roads.	Once works during this stage are completed, the road would be reopened in line with the permanent design.

Location	Indicative road network modifications	Indicative duration	Road reinstatement
Iron Cove Link civil site (C8) and Victoria Road	• All traffic lanes in each direction would generally be maintained with some short-term lanes closures (outside of peak periods where feasible and reasonable) subject to road occupancy licences • Temporary diversions would be put in place to allow for construction along the existing alignment • There would be no impacts to kerbside parking.	• Q4 2018 to Q2 2019 to complete road modifications for ingress and egress • Q4 2018 to Q3 2023 including construction duration staging, temporary roads and reinstatement of roads.	Once works are complete, the road would be reopened in line with the temporary design. When construction is complete, the road would be reinstated as per the permanent design.
Moodie Street at Rozelle	• Short-term, temporary closure of one lane of Moodie Street may be required during construction to facilitate utility works.	• Q4 2018 to Q3 2023.	Once construction is completed, Moodie Street would be reopened as per the existing design.
Callan Street at Rozelle	• Access to Callan Street from Victoria Road would generally remain open during construction • Temporary closures at the intersection with Victoria Road to allow for integration with the revised Victoria Road alignment may occur. Closures would be outside of peak periods where feasible and reasonable subject to road occupancy licences • During these periods, alternative access to Callan Street would be available from Springside Street and McCleer Street at Rozelle.	• Q4 2018 to Q3 2023.	Once works are completed, the road would be reopened in line with the permanent design.
Toelle Street at Rozelle	• Access to Toelle Street from Victoria Road would generally remain open during construction • Temporary closures at the intersection with Victoria Road to allow for integration with the revised Victoria Road alignment may occur. Closures would be outside of peak periods where feasible and reasonable, subject to road occupancy licences • During these periods, alternative access to Toelle Street would be available from Springside Street, McCleer Street, Callan Street and Manning Street at Rozelle.	• Q4 2018 to Q3 2023.	Once works are completed, the road would be reopened in line with the permanent design

Location	Indicative road network modifications	Indicative duration	Road reinstatement
Clubb Street at Rozelle	• Access between Clubb Street and Victoria Road would be permanently closed and a cul-de-sac established to accommodate the revised alignment of Victoria Road. Parking arrangements would be modified to accommodate the cul-de-sac.	• N/A (closed at the start of construction).	Access to Clubb Street from Victoria Road would be permanently closed.
Byrnes Street at Rozelle	• Short-term, temporary closure of one lane of Byrnes Street may be required during construction to facilitate utility works.	• Q1 2019 to Q4 2019.	Once utility works are completed, Byrnes Street would be reopened as per the existing layout Once works on the cul-de-sac of Byrnes Street are complete, this section of the road would be reopened in line with the permanent design.
Pyrmont Bridge Road tunnel site (C9)	• Works would be carried out to realign Bignell Lane between Mallett Street and Pyrmont Bridge Road at Annandale • Short-term, temporary closure of Bignell Lane would be required during construction to allow for the realignment works.	• Q3 2018 to Q4 2018 to complete road modifications • Q3 2018 to Q3 2022 including construction duration and reinstatement of roads.	Once construction is completed, roads would be reopened in line with the permanent design (ie realigned Bignell Lane).

Location	Indicative road network modifications	Indicative duration	Road reinstatement
Option B			
Parramatta Road West civil and tunnel site (C1b) and Parramatta Road East civil site (C3b)	• Works would be carried out on Alt Street and Bland Street to facilitate access via new driveways to the Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) • Temporary closures of one lane of Alt Street and Bland Street (either side of Parramatta Road) may be required for establishment of construction vehicle access provisions including installation of driveways and associated construction activities. Traffic management, that could include temporary diversions, would be implemented during temporary closures • Due to existing property driveways, there would be no loss of on-street parking on Alt Street or Bland Street.	• Q3 2018 to Q1 2019 to complete road modification • Q3 2018 to Q4 2022 including construction duration and reinstatement of roads.	Once road modification works are complete, both lanes along Alt Street and/or Bland Street would be reopened in line with the temporary design. When construction is complete, the road would be reinstated as per the existing arrangement.

Changes to parking accessibility from workforce parking demand will be managed by the car parking strategy for the project. The car parking strategy will be described in the CTAMP and will:

- Quantify construction workforce parking demand around project work sites and ancillary facilities during site establishment and the construction phase generally
- Identify public transport options and other management measures (such as carpooling and shuttle-buses) to reduce construction workforce parking demand
- Identify all locations that will be used for construction workforce parking
- Identify potential offsite areas that could be used for construction workforce parking that would be investigated and secured for use during construction where required and possible
- Identify exclusion zones, in consultation with potentially affected stakeholders, around construction sites and facilities where construction workforce parking would be restricted.

The strategy will also be developed in consultation with the M4 East and New M5 contractors to identify opportunities to use existing parking arrangements associated with those projects during their respective construction periods and once those periods are completed (see environmental management measure TT04 in **Chapter E1** (Environmental management measures)).

As part of the community consultation activities, proposed measures to manage the loss of on-street parking would be detailed. The car parking strategy would also provide a means for community feedback, monitoring, reporting and corrective actions identification to respond to parking issues as they arise during the construction phase.

Local businesses may experience increased competition for car parking including along Parramatta Road, Canal Road, Lilyfield Road, James Craig Road, Victoria Road and Euston Road. As the majority of these businesses would have their own private parking for staff and customers, it is unlikely that a reduced supply in public car parking would have a significant impact on employee or customer access.

As described in **Part D** (Preferred infrastructure report), it is proposed to relocate the bioretention facility at King George Park around 150 metres north of the location presented in the EIS, to an area adjacent to Victoria Road at the eastern abutment of Iron Cove Bridge and within King George Park. The existing informal car park at Manning Street would therefore remain in its current condition and would not be altered by the project. See **Chapter D3** (Relocation of the bioretention facility at Rozelle) for further information.

C8.8.3 Impacts on clearways

A submitter was concerned about the proposed spoil haulage route along Liverpool Road at Ashfield shopping centre as this may create more clearways. A submitter was also concerned about the proposed removal of clearway times on Parramatta Road and Pyrmont Bridge Road.

Response

No clearway along Liverpool Road is proposed as during project construction. Similarly no changes to clearways near the Ashfield shopping centre, on Parramatta Road, Liverpool Road or Pyrmont Bridge Road are proposed as part of project.

C8.9 Construction impacts on local roads

83 submitters have raised issues regarding impacts to local roads during construction. Refer to section 8.3 of the EIS for details of potential construction traffic and transport impacts.

C8.9.1 Request for detailed plans, including local area traffic management plan

Submitters have requested that detailed plans be provided to residents to allow for consideration of potential impacts. Submitters have also requested that local area traffic management plans be prepared in consultation with the residents.

Response

If the project is approved, the traffic management and traffic safety procedures and protocols would form part of the CTAMP and would be prepared in accordance with the relevant conditions of approval and the *Roads Act 1993* (NSW). The plan would be developed by the design and construction contractor(s) in consultation with relevant transport stakeholders and local councils. Following the adoption of these plans, the design and construction contractor(s) will be required to communicate their content to the community, in particular traffic management measures that may impact on residents and road users. It is necessary for the design and construction contractor(s) to prepare these plans as the contractor(s) will determine the specific detail of how and when the project would be constructed including staging of works and therefore what management measures are required and when. The CTAMP would be communicated to residents and the community at the earliest opportunity to provide the greatest notice of potential impacts.

Following the approval of the CTAMP, it would be made available on the WestConnex website or as otherwise required by the conditions of the approval.

C8.9.2 Road closures during construction

Submitters raised concerns relating to closures of local roads by the project during construction. Submitters raised the following issues:

- Potential closures of Callan Street and Toelle treet during the construction phase. These are generally at capacity on the weekends. The surrounding roads of Manning, McCleer and Darling streets are all narrow and are one-way, making the proposed access very limited
- Temporary closures at Bland and Alt Street because these streets are the main southern access routes to and from the school as well as for local community accessing opposite sides of Parramatta Road
- Objection to the closure of Clubb Street
- Concerned about the traffic diversion onto Ormond Street instead of Liverpool Road
- Objection to any traffic diversion from Darley Road on local streets

- Request that no road or lane closures are during school zone hours.

Response

Temporary closures and restrictions to some local roads would occur during the construction program. These may result in temporary inconvenience and an increase in travel time for some drivers. In addition, some neighbouring streets may gain additional traffic from diverted routes. Indicative temporary road network modifications during construction are described in **Table C8-2**. Callan Street and Toelle Street are noted as being at capacity on weekends. Traffic surveys undertaken for these and other roads demonstrate that while traffic levels on some roads are high on the weekends, weekday AM and PM peaks are generally the busiest times. Temporary closures of Callan Street and Toelle Street would be for short periods only to allow integration works to take place with the Victoria Road upgrades. These works would be undertaken outside of peak periods to minimise impacts. Access would be maintained during these times from Manning Street and McCleer Street.

Clubb Street would be disconnected from Victoria Road for the construction and the operation of the project. This is required due to grade differences that would be present between the widened carriageway of Victoria Road at this location and Clubb Street. Access to properties on Clubb Street will be maintained. Traffic surveys carried out in October 2017 indicate that Toelle Street currently functions as the main access to King George Park and so this would not change.

Closures on some roads may be required across extended periods of time as detailed in Table 7-22 of Appendix H (Technical working paper: Traffic and transport) of the EIS. Some changes may be required for the entire construction period. It would not be possible to only close these lanes outside of school zone hours. Based on the construction traffic assessment and the locations of schools, these closures would not have a significant impact on school zone operation.

Temporary lane closure on Bland Street and Alt Street in proximity to the Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) is required to allow access to these sites to be established. Access will remain available to residents. Access across Parramatta Road between Bland Street and Alt Street would remain available.

Road network modifications and traffic staging would be reviewed by the design and construction contractor(s) during the preparation of the CTAMP, with the objective of minimising disruptions to the road network. At all locations where road closures are required, access to properties would be maintained. Appropriate signage for road closures or detours would be installed. Measures to manage these impacts are described in **Chapter E1** (Environmental management measures).

Alterations would be required to Darley Road to establish safe accesses to the Darley Road civil and tunnel site (D4). These works would require occupation of the full width of the road to safely carry out the work. The works will be required outside standard construction hours due to existing traffic volumes on Darley Road and the need to maintain functionality of the road network during peak times. Traffic diversions through adjacent local roads would therefore be likely to facilitate the proposed work. These diversions would be temporary, with access along Darley Road reinstated at the completion of the work shift each night. The required alterations to Darley Road and associated traffic diversions along local roads would occur early in the construction program during establishment of the ancillary facility.

C8.9.3 Impacts to local road network from traffic diversions

Submitters raised concerns regarding traffic diversions during the construction phase. Specific concerns include:

- Diverting the arterial traffic from Darley Road down local streets will result in damage to streets. The childcare centre and school near the William Street/Elswick Street intersection will be impacted by diverting vehicles onto local roads.
- Concern that detours from WestConnex are going to make traffic worse on Park Street.

Response

Alterations would be required to Darley Road to establish safe accesses to the Darley Road civil and tunnel site (C4). These works would require occupation of the full width of the road to safely carry out the work. The works will be required outside standard construction hours due to existing traffic volumes on Darley Road and the need to maintain functionality of the road network during peak times. Traffic diversions through adjacent local roads would therefore be likely to facilitate the proposed work. These diversions would be temporary, with access along Darley Road reinstated at the completion of the work shift each night. The required alterations to Darley Road and associated traffic diversions along local roads would occur early in the construction program during establishment of the ancillary facility.

The required diversions are unlikely to require the use of Elswick Street at Leichhardt. The diversions would, however, likely use sections of William Street where it is aligned parallel to Darley Road. As the diversions would occur at night they would be unlikely to result in congestion or impact on local child care centres or schools. Also, as only limited diversions would be required, they would be unlikely to damage to road infrastructure. Measures will be included in the CTAMP regarding provision of directions for drivers around construction impacts so as to keep traffic off local roads where possible.

Due to the location of Park Street within the road network, the project is likely to have a negligible impact on Park Street as a result of construction works. There are no plans to divert traffic down Park Street during construction.

C8.10 Construction traffic environmental management measures

1,744 submitters have raised issues regarding the mitigation measures to reduce impacts to traffic and transportation during construction of the project. See **Chapter E1** (Environmental management measures) for details of the traffic and transport management measures for the project.

C8.10.1 Environmental management measures during construction

Submitters raised concerns regarding the traffic environmental management measures proposed during construction of the project. Specific concerns include:

- The CTAMP is inadequate and lacks detail
- The CTAMP should be prepared in consultation with the community and key stakeholders
- Lack of measures to prevent heavy vehicles using or queuing on local roads
- Lack of measures to address cumulative impacts with other projects
- Lack of measures to prevent impacts to parking, including specifically around Darley Road
- Lack of measures to manage pedestrian safety, including specifically around Darley Road
- Lack of detail regarding proposed diversions during construction
- Lack of plan to mitigate rat-running during construction by both truck drivers and motorists.

Submitters made a number of suggestions regarding the proposed traffic environmental management measures:

- Compensation should be provided for increased travel times due to construction traffic
- Construction traffic should be restricted to standard construction hours
- Requests for construction staff inductions to communicate spoil haulage routes and other traffic management measures
- All vehicles should be restricted to travelling on arterial roads
- Measures to be implemented to manage impacts from the heavy vehicle route at the Darley Road civil and tunnel site (C4)
- Request that heavy vehicle and car access to the Option B construction sites is via Parramatta Road only

- Request that measures be implemented to maintain pedestrian and cycle routes the following locations:
  - Victoria Road
  - Around Johnston Street
- Request that notification be made to the community regarding road closures and changes to the public transport network
- Measures should be implemented to prevent rat running
- Improve the traffic lights and the right hand turn from Johnston Street into The Crescent
- Request that all workers be mandated to use public transport to commute to and from the Darley Road site
- Requestion for a traffic mitigation plan concerning all roads and footpaths within 500 metres of the construction area, including but not limited to Victoria Road, Wellington Street, Merton Street and Darling Street for road users, pedestrians, buses and cyclists.

Response

The CTAMP will be prepared in accordance with Austroads *Guide to Road Design* (with appropriate Roads and Maritime supplements), the RTA *Traffic Control at Work Sites* manual and AS1742.3: *Manual of uniform traffic control devices – Part 3: Traffic control for works on roads*, and any other applicable standards, guidance or manuals. It will seek to minimise delays and disruptions and identify and respond to any changes in road safety as a result of highway construction works. The overarching strategy of the CTAMP will be to:

- Ensure all stakeholders are considered during all stages of the project
- Provide safe routes for pedestrians and cyclists during construction
- Design the permanent works and develop construction methodologies so that interaction with existing road users is minimised thereby creating a safer work and road user environment
- Plan and stage works to minimise the need for road occupancy, where possible
- Develop project staging plans in consultation with relevant traffic and transport stakeholders
- Minimise the number of changes to the road users' travel paths and, where changes are required, implement a high standard of traffic controls which effectively warn, inform and guide. This will minimise confusion by providing clear and concise traffic management schemes
- Comprehensively communicate changes to roads or paths to emergency services, public transport operators, other road user groups and any other affected stakeholders
- Identify measures to manage the movements of construction-related traffic to minimise traffic and access disruptions in the public road network
- Describe a car parking strategy for construction staff at the various work sites and ancillary facilities to limit impacts on the surrounding communities. The car parking strategy described in the CTAMP will:
  - Quantify construction workforce parking demand around project work sites and ancillary facilities during site establishment and the construction phase generally
  - Identify public transport options and other management measures (such as carpooling and shuttle buses) to reduce construction workforce parking demand
  - Identify all locations that will be used for construction workforce parking
  - Identify potential offsite areas that could be used for construction workforce parking that would be investigated and secured for use during construction where required and possible
  - Identify parking exclusion zones, in consultation with potentially affected stakeholders, around construction sites and facilities where construction workforce parking would be restricted
- Develop and implement a truck management strategy (as part of the CTAMP) that:

- Identifies truck marshalling areas that can be used by project-related heavy vehicles
- Describes management measures for project-related heavy vehicles to avoid queuing and site-circling in local roads and other potential traffic and access disruptions
- Describes monitoring program to demonstrate that project-related heavy vehicles are complying with the strategy.

The CTAMP will be prepared in consultation with relevant transport stakeholders and local councils (see environmental management measure TT01 in **Chapter E1** (Environmental management measures)).

The management of local road closures will be undertaken in consultation with TMC (as required), Roads and Maritime, local councils and property owners likely to be impacted. A complaints management system will be established that will allow residents and property owners to provide feedback on issues as they arise. As part of the complaints management system measures for the implementation of corrective actions will also be established to address the identified issues or complaints.

The construction of the project would not result in a significant increase in construction vehicle numbers on the road network, compared to existing traffic levels. Construction traffic to and from construction ancillary facilities represents a very small increase in traffic compared to background traffic volumes on the adjacent arterial roads. Compensation is not considered for impacts to travel times.

Staging the construction works on key parts of the network, such as City West Link, Victoria Road, The Crescent and Anzac Bridge, would be critical to enable these key roads continue to function with as minimal impact as possible. The intent is to minimise, to the extent possible, heavy vehicle movement on the arterial road network during peak hours.

During construction, designated heavy vehicle routes would be identified and communicated, along with site access requirements and restrictions, to all relevant drivers. Indicative haulage routes are identified in section 6.6.5 of the EIS and are generally limited to arterial roads where feasible (section 6.6.5 of the EIS is updated for the Darley Road civil and tunnel site (C4) as per **section C8.7.1)**. Designated heavy vehicle would be confirmed in the CTAMP, as reflected in environmental management measure TT15 in **Chapter E1** (Environmental management measures). Given the dispersed nature of light vehicle travel routes to and from construction sites it is not feasible to limit light vehicles to a particular route or routes during construction.

The use of out-of-hours working times will allow traffic movements to occur when they are least likely to impact on road users or cause congestion. Out-of-hours works also enables more work to be undertaken in a shorter period and therefore the overall construction period and the duration of associated amenity impacts can be shortened. It is understood that traffic impacts from out-of-hours works primarily relate to noise impacts. See **Chapter C10** (Noise and vibration) and **Chapter E1** (Environmental management measures) for information on mitigation measures for traffic generated noise. Spoil haulage would be limited to standard construction hours at the Darley Road civil and tunnel site (C4).

Worker transport and parking would also be managed by the CTAMP. Provisions will be made for the incorporation of measures to encourage workers to use public transport. It is not feasible however to mandate that all workers use public transport only. As detailed in **section C8.8**, worker parking is available at a number of the construction ancillary facilities. In order to make the best use of the available on-site parking, shuttle buses will move workers between sites to reduce pressure on local parking demands around each construction ancillary facility. The car parking strategy will be developed in consultation with the M4 East and New M5 contractors to identify opportunities to use existing parking arrangements associated with those projects during their respective construction periods and once those periods are completed.

See **section C8.7.1** for information regarding the refinement of the design for the Darley Road civil and tunnel site (C4) in response to potential impacts to the performance of the road network, safety and access.

Construction worker parking at Darley Road would be provided within the Darley Road civil and tunnel site (C4) and on-street parking along the eastbound carriageway of Darley Road between around Francis Street and Charles Street would potentially be removed (about 12 spaces) during construction. Impacts on the kiss-and-ride parking for the light rail stop will be considered in the CTAMP. As described in **section C8.7.1**, the design of the Darley Road civil and tunnel site (C4) has been refined to remove the proposed right turn arrangement from City West Link into Darley Road to minimise potential traffic safety impacts.

Potential truck marshalling areas would be identified during development of the truck management strategy and utilised, where possible, to minimise potential queueing and traffic and access disruptions in the local area. An additional construction ancillary facility (the White Bay civil site (C11)) is proposed in **Part D** (Preferred infrastructure report) on a portion of the Port Authority of NSW land located near White Bay. The facility would provide a truck marshalling area for around 40 heavy vehicles transporting tunnel spoil and parking for about 50 construction light vehicles. The facility would also provide additional space to store construction plant and machinery and materials at the site. See **Chapter D2** (White Bay civil site (C11)) for further information.

While specific mitigation measures for the cumulative scenarios assessed in this report are beyond the scope of this EIS, the issues identified would be examined as part of the design development for the proposed future Western Harbour Tunnel and Beaches Link and the proposed future Sydney Gateway projects, and as part of Roads and Maritime network mitigation strategies.

On-going consultation with the design teams for these projects is occurring with the objective of minimising cumulative traffic impacts.

The CTAMP to be prepared for the project will include provisions to ensure that construction vehicle operators are made aware of posted speed limits, and regular traffic safety updates would be held with all construction personnel via project inductions and toolbox talks. The CTAMP will also include provisions for managing traffic near the construction ancillary facilities. This may include signage and detailed of lane or road closures. Measures to prevent rat-running or alternative route use by drivers who are seeking to avoid areas around the construction ancillary facilities would also be documented. It is noted however that the project cannot control driver behaviour.

Proposed access to the construction sites for the project is summarised in Table 6-21 of the EIS. The spoil haulage route and light vehicle access points for the Parramatta Road West civil and tunnel site (C1b) is shown in Figure 6-27 of the EIS and would be in and out via Parramatta Road only (except during exceptional circumstances as outlined in section Table 6-24 of the EIS). Designated route for project-related heavy vehicles and any associated use restriction would be documented in the CTAMP.

Changes to pedestrian and cyclist facilities during construction are outlined in section 6.6.2 of the EIS. Temporary, periodic closure of the shared paths on the eastern and western sides of Victoria Road at Rozelle would be required during construction. Works would be staged so that the shared path on either the eastern or western side of Victoria Road at Rozelle would remain open at all times.

Periodic, temporary closures of the footpath on the eastern and western side of The Crescent at Annandale between City West Link and Johnston Street at Annandale would be during construction. Works would be staged so that the shared path on either the eastern or western side of The Crescent would remain open at all times. There are no plans or need to amend the current arrangement of the intersection of Johnston Street and The Crescent. Any changes to this intersection fall outside this project.

Notification of road works would occur via standard construction signage around affected areas. Any bus stop relocations would be agreed with Transport for NSW and all affected bus operators.

Impacts from drivers seeking to avoid construction sites are discussed in **section C8.4.2**. Overall, there is limited opportunity for through traffic to utilise parallel routes around the sites of the construction ancillary facilities as they do not represent significant time saving routes. In regard to the travelling public and the potential to take alternative routes, while the traffic around construction ancillary facilities would be managed to the extent possible by the project, the project cannot control the behaviour of individual public drivers.

A submission requested that a traffic plan be prepared for all roads and footpaths within 500 metres of the construction area. The CTAMP would include measures to address the projects impacts where and as they occur. It would not be appropriate to place an arbitrary distance at which management measures would or would not be applied.

C8.10.2 Traffic safety mitigation measures

Submitters noted that the EIS does not propose any mitigation measures to address the risk to pedestrian, cyclist and vehicular safety during construction. Specific concerns include:

- Management measures to mitigate accidents at the Darley Road construction site has not been included in the EIS
- Request for truck management plans to be implemented near Rozelle Public School, Dobroyd Point Public School and Haberfield Public School for children's safety
- Need for additional footbridges/underpasses across Victoria Road to Darling Street and to Terry Street
- Request that safety barriers need to be installed to protect residents facing Darley Road
- Pedestrian crossings at the Bland Street crosswalk near Haberfield School should be manned by a traffic controller
- Concern that the two entrances on City West Link, one opposite the exit of The Crescent and one 400 metres further west on City West Link, will have to have traffic controls set up to allow trucks to access and exit
- Request that additional safety features be applied to the operation of construction vehicles for the project
- Request that a greenlight arrow be added to the traffic signals at the intersection of bland street and Parramatta Road and the pedestrian signal be initiated first in the signal cycle to allow pedestrians to cross the stress before the cars start moving
- Request that all traffic controllers involved on the project take a skilled induction course that must be documented and in the conditions for the traffic controller contracts
- Request for a traffic management plan to safely manage construction traffic movements and include provisions for unexpected results due to construction traffic
- Request for appropriate management measures for worker contractor parking as residents near construction sites will be directly impacted, especially those living between James Street and Falls Street
- Request that all contracted workers to use public transport or be transported by bus to the Darley Road civil and tunnel site as the surrounding area can only provide 11 out of the 100 required parking spaces daily. There needs to be conditions and restrictions to be included in a contracts and approval documentation
- Lack of traffic mitigation measures for the increase of construction vehicles impacting the nearby homes and residents
- Measures should be implemented to ensure minimal impacts to residents due to night works at the Darley Road civil and tunnel site are achieved
- Request for a pedestrian safety marshal at the Parramatta Road/Bland Street junction during all school zone hours.

Response

The CTAMP will include measures for the safe management of construction traffic. It will be prepared in accordance with *Austroads Guide to Road Design* (with appropriate Roads and Maritime supplements), the RTA *Traffic Control at Work Sites* manual and AS1742.3: *Manual of uniform traffic control devices – Part 3: Traffic control for works on roads*, and any other relevant standard, guide or manual that the design and construction contractor(s) may be made to consider in its preparation.

In preparing the CTAMP, the design and construction contractor(s) will need to consider a range of measures for the safe movement of construction traffic. This includes minimising disruption or changes to the road network and staging works in a manner that minimises driver confusion. The CTAMP will also need to be prepared in consultation with local council. Measures detailed in the plan are also required to be communicated to the community to make them aware of changes to road traffic conditions. In addition to road transport laws, such as heavy vehicle licensing to ensure vehicles are suitable for the chosen task, the implementation of additional safety features on construction vehicles for the construction of the project would be at the discretion of the design and construction contractor(s).

The CTAMP would also include reporting and feedback mechanisms to allow for adjustments to management measures to be made. For example, if unexpected traffic impacts are encountered, the CTAMP would be reviewed and appropriate measures amended or added to address the specific matter.

Safety provisions will be incorporated in the CTAMP. This will include measures for the separating of the general public, including pedestrians and cyclists, from construction areas and separating live traffic and construction areas to ensure safety issues are addressed and appropriately managed. A range of measures, including safety barriers and truck movement routes, would be considered across all construction ancillary facilities as necessary. The design and construction contractor(s) will develop these measures as part of the development of the CTAMP in consultation with local councils and the community.

Construction workers would be encouraged to use public transport or project specific staff transport management measures such as staff buses, although it is not feasible to require all stuff to use such means of transport. A car parking strategy would be developed and implemented to manage potential parking impact due to construction vehicles around project sites.

Signalised crossing design, including the incorporation of turning arrows and pedestrian movement lights would be detailed in the final detailed design. It should be noted however that the design as represented in the EIS would reflect all allowed movements assessed in the EIS.

Traffic controllers would be suitably trained and qualified. The request for a dedicated pedestrian safety marshal to be provided at the corner of Parramatta Road and Bland Street during all school zone hours is not deemed necessary with the projects proposed construction traffic management measures in place. Crossing the road at this location would present a similar safety risk to pedestrians during construction as is currently experienced.

Safety measures will be implemented as necessary to minimise the potential interaction of school children, and all pedestrians, where they may be in proximity to construction ancillary facilities, including Rozelle Public School. Details of dedicated truck routes would be included in the CTAMP and the community would be consulted on these routes prior to their implementation to allow safety concerns to be comprehensively addressed.

The CTAMP would include measures to reduce impacts from night works in relation to residents in close proximity to ancillary construction facilities as applicable to each ancillary facility.

C8.11 Quality, independence and adequacy of the operational traffic modelling

1225 submitters have raised issues regarding the level and quality of operational traffic forecast and modelling for the operational project.

C8.11.1 Assessment of operation traffic impacts

Submitters raised concerns about the adequacy, accuracy and independence of the operational traffic and transport impact assessment. Specific concerns included:

- The EIS does not properly address the impact of rat-running on local streets, and the impact of tolls on rat-running. The EIS does not discuss what enforceable obligations will be placed on the NSW Government to address the impacts of rat-running
- Specific concerns over the accuracy of the traffic modelling conducted for Rozelle interchange

- The EIS does not make a statement of the reliability of the traffic modelling, hence not meeting the SEARs. The model's margin for error is not stated
- The estimate of traffic levels is inaccurate
- The assessment does not provide impacts of dispersed traffic on connecting roads, such as Anzac Bridge
- The existing bottlenecks at Anzac Bridge and Iron Cove Bridge were not addressed by the traffic study
- The underlying traffic modelling and outputs was insufficient to demonstrate the need for the project
- The justification for the project depends on speculative traffic predictions for the future. Concern that the inadequacy of the traffic model will impact on the air quality and noise assessments
- The EIS does not provide for operational modelling for the Darley Road area and City West Link
- The traffic analysis is inadequate and shows that areas such as around St Peters interchange will be considerably more congested in 2033
- Inadequate traffic analysis for Erskineville Road, Mitchell Road and Edgeware Road
- Lack of evidence of traffic modelling for the inner south area as a large amount of cars will be funnelled into this area
- Concern that traffic for all stages of WestConnex has been overestimated. A report by Citi Financial analysts were of the view that the traffic predictions were unlikely to be achievable. The traffic model was developed by Roads and Maritime therefore compromising the independence of the traffic model and assessment. The model was not provided for scrutiny or independent assessment
- Insufficient explanation of the nature of the traffic model, where it can be accessed and the function it plays in the analysis
- There is not sufficient information about the methodology, input data or assumptions for the forecasts to be independently verified
- Submitters do not trust the traffic models predictions and benefits due to their own experiences on Parramatta Road becoming more congested with the new tolls on the M4 Widening
- The traffic modelling approach applied in the EIS is flawed
- The EIS has failed to take into consideration the travel patterns of residents in western Sydney
- The EIS has not adequately assessed the Without project' and 'With project' scenarios
- The EIS should have included the connectivity plans of public transport for the Parramatta Road corridor
- While WestConnex might integrate with the wider motorway network, no evidence is provided demonstrating that it integrates with the wider road network or the broader transport and land use system. For example, the EIS provides no information about changes in traffic volumes entering the Sydney CBD caused by WestConnex. Roads and Maritime has only just commenced work to identify which roads fanning out from WestConnex portals will need to be upgraded to deliver large numbers of vehicles to and from the project. It is therefore difficult to form a properly informed understanding of the environmental impacts
- Submitters questioned:
  - What is the exact metric by which "reducing traffic congestion on local roads" will be measured?
  - What evidence is there that the motorway will achieve this?
  - Will this be tracked and publicised?

Response

The WRTM v2.3 is a strategic model developed and operated by Roads and Maritime Services (Roads and Maritime) to provide a platform to understand changes in future weekday travel patterns under different land use, transport infrastructure and pricing scenarios. Although the WRTM is a network-wide model that encompasses existing and future road networks in the Sydney metropolitan area, it was principally developed to assess infrastructure improvements associated with the WestConnex component projects individually and in combination. The WRTM v2.3 was used for this EIS, and as traffic models undergo constant development and refinement, it is anticipated that future projects would use further iterations of WRTM as they become available. The traffic modelling is as accurate as possible at the time of modelling having been based on the most up to date input information available. As detailed in section 4.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS, the modelling approach and assessment has been undertaken in accordance with the SEARs which outline the modelling approach to be undertaken for the assessment as well as the guidelines which the assessment needed to follow.

To ensure the modelling used in the EIS is as accurate and representative as possible the traffic model has been developed in the manner summarised below and detailed in full in section 4.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS:

- Task A – Traffic demand forecasts are developed taking into consideration a number of factors including but not limited to: historical demands (traffic counts and surveys), current and future mode choice factors, toll behaviour factors, land use projections (population and employment locations)
- Task B – Future year demand development, with and without the project, including induced demand. This provides an analysis of the projected future (2023 and 2033) year traffic demands based on the information derived from Stage 1
- Task C – Assessing the operational impact of the project by applying the anticipated impact of the project to the 'Without project' and 'With project' scenarios developed in Stage 2 to determine the impacts of the project.

The WRTM is linked to the Strategic Travel Model (STM). The STM is operated by Transport for NSW TPA and is used to assess travel patterns in Sydney, Newcastle and Wollongong under different land use, transport and pricing scenarios. For WRTM v2.3, this data has been supplied by TPA as data extracts from the STM and is based on the latest population and employment projections.

The population and employment projections are based on the latest land use data available at the time of forecasting (version LU14v4) produced by DP&E. This data has been projected from the 2011 census data and incorporates known major urban renewal projects and developments, including those around Green Square and Mascot town centres. The base vehicle demands from STM are consistent with these demographic assumptions and therefore provide a consistent base for the future demands used in the WRTM. Projects and developments included in the WRTM v2.3 modelling also include the strategic directives contained in *A Plan for Growing Sydney* (NSW Government 2014a) in 14 transport and land use corridors:

- Arncliffe to Banksia
- The Bays Precinct
- Broader Western Sydney Employment Area
- Central to Eveleigh
- Glenfield to Macarthur
- Greater Macarthur Investigation Area
- North-western Growth Area
- Parramatta
- Western Sydney Airport
- South-western Growth Area
- Sydney Metro – Bankstown to Sydenham
- Sydney Metro – City and Inner Southwest

- Sydney Metro – Northwest
- Sydney to Parramatta (including the *Parramatta Road Corridor Urban Transformation Strategy*).

Work in relation to public transport and connectivity for corridors such as the Parramatta Road corridor are the responsibility of others and outside the scope of the project. For example, Transport for NSW - Sydney Buses would manage network changes to bus routes. Further discussion in relation to public transport is provided in **section C8.23**.

The WRTM has also included planned future port activities and uses, for instance at Port Botany, Sydney Airport Freight terminal and intermodal terminals.

Based on experience on previous projects of a similar nature, the approach taken provides an appropriate level of accuracy for assessing project impacts. Air quality and noise quality modelling that uses traffic inputs derived from the traffic modelling are therefore also considered reliable within the limitations of modelling as described above. Refer to Chapter 9 (Air quality) and Chapter 10 (Noise and vibration) of the EIS for specific responses in relation to these matters.

As part of the traffic modelling the impact of road users using alternative surface routes when the project is operational has been assessed. The assessment of the potential impacts for the project provided in Chapter 8 (Traffic and transport) and Appendix H (Technical working paper: Traffic and transport) of the EIS, assessed the potential impacts of the 'With project 2023' and 'With project 2033' scenarios and included an assessment of the anticipated impacts on key road corridors adjoining the project. This included roads that may be considered as providing alternative surface routes. Chapter 9 of Appendix H (Technical working paper: Traffic and transport) of the EIS details numerically and graphically (in Figure 10-3 to Figure 10-14) the anticipated change in traffic flows on non-motorway links to and through the project footprint. Detailed discussion in response to questions regarding parallel route assessment is provided in **section C8.18**.

Due to the nature of the project and the traffic it is intended to serve, it is anticipated that there would be some increases and some decreases to traffic on alternative surface routes. The traffic modelling shows that with some traffic from surface roads shifting to the project, some corridors are anticipated to see a reduction in traffic, notwithstanding background traffic growth or urban growth in the immediate vicinity of this road. Reduced traffic is forecast on sections of major arterial surface roads including Norton Street, Balmain Road, Lyons Road, City West Link, Parramatta Road, Victoria Road, King Street, King Georges Road and Sydenham Road. Increases are forecast to occur between the 'Without project' and 'With project' on roads including Ross Street, Johnston Street, Catherine Street and Gladesville Bridge.

Submitters were concerned that some roads were not included for analysis, including roads in Erskineville and Newtown. Section 9.4 of Appendix H (Technical working paper: Traffic and transport) of the EIS considers potential changes on north–south regional connector roads (Stanmore Road, Addison Road, Sydenham Road, Marrickville Road, King Street, Wyndham Street, Botany Road, Elizabeth Street, South Dowling Street and Southern Cross Drive). Key observations comparing the 2023 'Without project' and 'With project' scenarios are:

- There is a 10 per cent increase in two-way AWT forecast to cross the screenline in the 'With project' scenario. However, this increase is entirely on the M4-M5 Link. Two-way traffic on the M4-M5 Link is forecast to be 16 per cent of total two-way AWT crossing the screenline, with AWT crossing the screenline on existing surface roads forecast to decrease by seven per cent
- The greatest forecast reductions in traffic volume occur on Stanmore Road and Southern Cross Drive. Total two-way AWT is forecast to fall by just under 6,000 vehicles daily or 16 per cent on Stanmore Road, and by about 5,500 vehicles daily, or three per cent, on Southern Cross Drive
- There are also significant forecast reductions on King Street, where two-way AWT traffic decreases by just under 4,000 vehicles daily (a drop of 19 per cent), and on Sydenham Road where two-way AWT traffic decreases by about 3,000 vehicles daily (a drop of 10 per cent).

Submitter's experiences of traffic on Parramatta Road are noted, however are not considered representative of the forecast impact of the project, including the positive impacts, particularly in the 2023 and 2033 scenarios (as described in Chapter 13 of Appendix H (Technical working paper: Traffic and transport) of the EIS). The increase in traffic on Parramatta Road is likely to have coincided with the reintroduction of tolling on the M4 Motorway. This was identified as a likely outcome in both the M4 Widening and M4 East EISs. However, as detailed in the M4 East EIS traffic and transport assessment, traffic is forecast to shift from Parramatta Road to the M4 East once that project is open to traffic in 2019.

The modelling forecasts that St Peters interchange would be congested in the 'With project' 2033 scenario. This is to be expected when compared to the current situation, where there is no traffic from the M4-M5 Link going to St Peters (as this link does not currently exist within the road network). Additionally, background traffic growth from urban development, increased trips to/from Sydney Airport and increased road freight generation to/from Port Botany would also lead to an increase in traffic using the St Peters interchange in 2033.

Potential traffic flows to the area have been fully considered. In regard to potential traffic impacts to the inner south of Sydney, the WRTM v2.3 traffic model includes modelled impact to, and as a result of, the operation of the M5 Motorway which is the key link to the inner south. Additionally, the lower north-south screenline analysis assessed the potential use of parallel routes in southern Sydney such as Wyndham Street, Botany Road, Southern Cross Drive and King Street.

The traffic modelling used in the assessment of potential impacts of the project focussed on the potential operational impacts of the project. The strategic justification and need for the project, including reference to traffic information which forms the justification for the project is provided in Chapter 3 (Strategic context and project need) of the EIS.

Chapter 10 of Appendix H EIS (Technical working paper: Traffic and transport) of the EIS demonstrates that the project would result in fewer or shorter journeys, in both time and distance, on the surface road network as traffic shifts onto the M4-M5 Link (refer to Table 10-1 and Table 10-3 in Appendix H (Technical working paper: Traffic and transport) of the EIS).

The parameters for the assessment of changes to levels of congestion for the project are outlined in section 8.1.8 of the EIS. An assessment of the project against these parameters is provided in section 8.3 of the EIS. See **section C8.12.4** regarding the assessment of impacts on local roads.

Roads and Maritime will undertake a review of network performance following the project coming into operation. This will be undertaken in consultation with Transport for NSW and relevant councils, to confirm the operational traffic impacts of the M4-M5 Link on surrounding arterial roads and major intersections at both 12 months and at five years after the commencement of operation of the M4-M5 Link. The assessment would be based on updated traffic surveys at the time and the methodology used will be comparable with that used in this assessment. The results of the review will be considered in future operational network performance planning carried out by Roads and Maritime (see environmental management measure OpTT1 in **Chapter E1** (Environmental management measures) for further information). These reviews will also allow changes to the surface road network to be coordinated with the operational impacts of the project on the wider surface road network.

C8.12 Operation – traffic modelling technical queries

1858 submitters have raised issues regarding the level and quality of the operational traffic forecast and modelling for the operational project.

C8.12.1 Traffic modelling assumptions

Submitters were also concerned that the WRTM model is not publically released making its assumptions impossible to be tested or be independently peer reviewed.

Submitters also noted that the following factors were not taken into account in the traffic model:

- Autonomous and electric vehicles and shared ride services (eg Uber)
- Flexible working (people working remotely)
- Different scenarios in which an increase in the frequency of bus services and/or bus lanes been incorporated
- Population growth and employment changes
- The traffic generation assumption for redistributed trips is not validated
- Traffic disruptions caused by changes to technology
- Changes in motor vehicle business tax arrangements
- The model assumes that all unconstrained traffic travels at the posted speed limit, even when lanes merge and traffic enters and exits the motorway

- Assumptions relating to future urban development and future population growth in Sydney were not assessed, for example, the proposed Badgerys Creek Airport at western Sydney
- The traffic assessment assumes the proposed future Sydney Gateway and Western Harbour Tunnel projects would be completed and operational by 2023 and this might not happen
- Concern that the assumption that traffic would dissipate at the edge of the motorway with no negative impacts on the network performance at the Sydney CBD, Mascot and Alexandria is incorrect
- The EIS did not sufficiently demonstrate assumptions regarding parking demand and traffic generation
- The model assumes even 24 hour flows
- Traffic modelling assumes steady traffic growth for Sydney however this is incorrect
- The modelling should use updated census data
- It is insufficient to speculate that traffic may take alternate routes in congested conditions
- The assessment assumes the network has capacity to carry forecast traffic when in reality many inner city roads are already heavily congested
- Travel patterns in the real world are very different to the patterns identified in traffic modelling
- The assumption that the Iron Cove Link is toll free needs to be guaranteed or else the modelling will be inaccurate
- Submitter is unhappy that EIS states that peak spreading will occur to mitigate congestion issues in 2033.

Response

The EIS explains that the operational traffic and transport impacts were evaluated using traffic demand data from the WRTM. The model was developed to forecast road traffic demands for the WestConnex component projects including the M4-M5 Link. The WRTM uses the STM for base demand and includes the capability to address future changes in land use trip distribution and mode choice as well as producing vehicle traffic demand during peak and off peak periods. Modelling input data included the collection of average daily traffic (ADT) to determine total daily flows and peak hour information. Peak hour data was used to assess the busiest time of day. The WRTM also models driver behaviour to toll strategies and forecasts traffic choice between toll and non-toll routes during separate peak and inter-peak periods. The model has been built using base and future population and employment data for metropolitan Sydney which was sourced from the DP&E and used by Transport for NSW TPA to calculate trip generation. This approach was developed in consultation with toll forecasting advisors and recognised experts in demand forecasting in Australia.

The WRTM model was developed and calibrated to observed survey data (traffic counts collected in 2012), then validated against 2012 Sydney wide travel time comparisons. A key input into the model also includes Value of Travel Time Savings (VTTS), which reflect driver behaviour surveys and their willingness to pay on toll roads. Future demand was forecast by applying the model with forecast future year traffic trip information from the STM.

The traffic model for the year of opening (2023) 'Cumulative' scenario includes traffic associated with NorthConnex, M4 Widening, M4 East and the New M5 as well as the proposed future Sydney Gateway and the Western Harbour Tunnel component of the proposed future Western Harbour Tunnel and Beaches Link complete and operational. See **section B10.8.4** for further detail regarding the inclusion of the proposed future Western Harbour Tunnel and Sydney Gateway in the operation (cumulative) 2023 scenarios.

The 2023 'With project' scenario assesses traffic conditions where the proposed future Western Harbour Tunnel and Sydney Gateway are not operational.

To determine potential impacts on the wider road network, a screenline analysis was undertaken that assessed impacts on key routes outside of the operational modelling boundaries for the project. The screenline analysis assessed key routes and parallel routes, which may be used by commuters as an alternative to the project. Project specific VTTS surveys of drivers' willingness to pay tolls were carried out to inform the toll choice modelling to enable the model to best reflect current driver behaviour in the specific context of the WestConnex component projects.

Operational modelling focused on the areas identified as potentially being the most affected by the project interchanges. While the WRTM provides strategic travel demand forecasts across the Sydney metropolitan area, more detailed operational models were required to fully evaluate operational impacts on the surrounding road network in the vicinity of each of the Wattle Street, Rozelle and St Peters interchanges. The methodology for determining the extent of the assessment area is detailed in section 4.2.3 of the EIS and Annexure B of Appendix H (Technical working paper: Traffic and transport) of the EIS.

An integral part of the modelling process was the involvement of independent expert peer reviewers to examine model development, methodologies for the production of traffic models and the traffic forecasts. The independent peer reviewers included an independent expert who is recognised in the field of toll road patronage forecasting and transport behavioural choice modelling.

Traffic modelling for the project has relied on trip generation data from Transport for NSW TPA, which is the best information currently available. These projections were based on the DP&E future population and employment forecasts (dated September 2014), which has been derived from the 2011 census data and incorporates known major urban renewal precincts and development projects such as The Bays Precinct, Parramatta Road corridor, Green Square, Central to Eveleigh, Western Sydney Airport, Port Botany, Sydney Airport Freight terminal and intermodal terminals. Census data from 2016 was not published at the time when traffic modelling was undertaken for the EIS. A list of the key transport and land use corridors incorporated into the model are listed in section 4.2.3 of Appendix H (Technical working paper: Traffic and transport) of the EIS. Public transport use, including bus trips, is also factored into traffic forecasts.

Changes in transport technology and trip patterns, due to developments like autonomous vehicles, new technologies, and increased use of web-based transport on demand services, may affect future travel demand, but at this time there is a lack of conclusive quantitative evidence on what these effects might be. Therefore, this has been excluded from the analysis. For the purposes of the study and the traffic forecasts used, assumptions around technology and the economics of energy and economic performance are assumed to be constant for all future scenarios, ie with and without the project. This includes assumptions in regards to other changes in the economy such as flexible working arrangements.

The WRTM contains commercially sensitive information and is not publically available. The WRTM has been reviewed by independent experts who have verified its suitability for use in the NSW Government's planning investigations.

The traffic assessment included assumptions about the timing of the construction and operation of the proposed future Sydney Gateway and Western Harbour Tunnel and Beaches Link projects for the operation 'Cumulative 2023' and operation 'Cumulative 2033' scenarios. These projects are subject to separate environmental assessment and approval. In the event of unforeseen delays to these projects, this would impact the traffic forecasts anticipated for the cumulative scenarios in the EIS. It should be noted that project only scenarios have also been assessed in the EIS for the years 2023 and 2033 to allow assessment of the project in isolation. Should the Sydney Gateway project be delayed for a significant length of time, it is expected that both the New M5 Road Network Performance Review Plan (conditioned as part of the New M5 approval) and the proposed M4-M5 Link Road Network Performance Review would confirm the operational traffic impacts of the projects on surrounding arterial roads and major intersections. Refer to section 11.2.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS for further information.

The assessment identifies existing traffic volumes and patterns including roads that are currently subject to congestion in section 8.2 of the EIS and Chapter 6 of Appendix H (Technical working paper: Traffic and transport) of the EIS. Existing traffic volumes and patterns (and therefore existing congestion) are used to inform the traffic models for future scenarios for the assessment of potential operational traffic impacts, therefore reflect how changes to traffic demand and road infrastructure will change existing patterns and offer reliable assessments of future road network conditions.

Further details of the traffic modelling process is provided in section 4.2 and 8.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS.

The Iron Cove Link would not be tolled for the project (refer to Table 3-2 of the EIS).

By 2033, peak demand conditions with or without the project are potentially likely to start earlier and finish later than today to accommodate greater forecast traffic demand arising from increased population and changes to land use. Due to forecast growth in travel arising from population growth and resulting congestion, some of this traffic is predicted to not be able to start or finish their journey within the peak period. Some drivers will choose to make their journey either earlier or later in the peak period to avoid delay. This behaviour called 'peak spreading'. Peak spreading is an anticipated behaviour and is not proposed as a mitigation measure for the project. Refer to section 11.2.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS for further information regarding the concept of peak spreading.

C8.12.2 Traffic model boundaries

Submitters raised concerns that the study area is too small to capture all the transport impacts of the project and that the project would affect transport demand and behaviour across the whole metropolitan area.

Response

The study area for the traffic and transport assessment was informed by the forecast traffic and transport changes from the WRTM, a strategic traffic model that covers the Sydney metropolitan area. The extent of the study area and the areas requiring operational modelling assessment were determined through analysis of forecast WRTM traffic flow differences as a result of the project.

The study area broadly encompasses an area extending from the Parramatta River in the north to Sydney Airport in the south and from the Eastern Distributor in the east to Haberfield and Marrickville in the west. It is predominantly focused on the corridor between Haberfield and Rozelle, the corridor between Rozelle and St Peters, the corridor between Haberfield and St Peters, as well as the surface road networks around the Wattle Street, Rozelle and St Peters interchanges.

Section 4.2.3 of Annexure B of Appendix H (Technical working paper: Traffic and transport) of the EIS provides a justification of the nominated boundaries of the operational model areas. Operational modelling was focused around the areas of largest local impact in the AM and PM peak hours, which are generally around the motorway interchanges, namely the Wattle Street interchange, the Rozelle interchange and the St Peters interchange.

In order to determine potential impacts on the wider road network, screenline analysis was undertaken which assessed impacts on key routes outside of the boundaries of the operational modelling undertaken for the project. The screenline analysis assessed key routes and parallel routes which may be used by commuters as an alternative to the project (refer to Chapter 9 of Appendix H (Technical working paper: Traffic and transport) of the EIS for further information). It is therefore appropriate that modelling focused on the areas immediately adjacent to the project footprint which have the most potential to be impacted by the project.

C8.12.3 Changes to the traffic model from preceding WestConnex projects

Submitters have raised concerns that there are differences in the strategic traffic model for the M4-M5 Link and the M4 East and New M5 projects and that there is no clear explanation of how the assumptions that underpin the WRTM have changed between the EISs for the preceding WestConnex projects.

Response

Changes from the M4 East and New M5 EIS assessments are outlined in section 4.2.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS. WRTM v2.3 was used for this EIS, while WRTM v2.1 was used for both the M4 East EIS and the New M5 EIS. Since the M4 East and New M5 EIS traffic assessments were undertaken, updates to the WRTM inputs have occurred, as well as enhancements to the WRTM zones and growth processing. These updates and enhancements include:

- DP&E's updated land use forecasts, including in particular, revised land use development along Parramatta Road corridor, The Bays Precinct, Central to Eveleigh, Western Sydney Airport and at Mascot town centre, as well as increased precision in respect of the land use zoning used in the WRTM
- Evolution and refinement of the M4-M5 Link design, with increases in the number of lanes in the mainline tunnels from three lanes to four lanes, revised layout for the refined Rozelle interchange,

the addition of the Iron Cove Link and the removal of the previously proposed Camperdown interchange.

The future years assessed in the M4 East and New M5 EIS traffic assessments were 2021 and 2031. Due to the delivery timeframe of the M4-M5 Link project, 2023 and 2033 have been used. Therefore, the travel demand and traffic volumes are also being forecast to different years compared to the EISs for the M4 East and New M5 projects. A direct comparison between the modelled results of the preceding EISs and this EIS would therefore not be a like-for-like comparison.

The changes in forecast traffic volumes resulting from the changes in design of the M4-M5 Link compared to that used in the traffic assessments for the M4 East and New M5 projects is presented in Annexure C of Appendix H (Technical working paper: Traffic and transport) of the EIS.

C8.12.4 Assessment of impacts on nearby roads

Submitters raised concerns that the operational model was not used to assess the potential impacts on the operational network performance of roads outside the project footprint and local roads in the vicinity of project.

- The EIS does not assess the impact that the flow of cars and trucks out of tunnel exits will have on local roads. This disguises the traffic impacts on inner west communities
- There is no traffic modelling in the EIS traffic analysis about impacts on roads including Erskineville Road, King Street or Enmore Road
- The model does not take into account neighbouring roads around the St Peters interchange
- The EIS did not adequately model the impact of local roads in the Alexandria and Newtown areas
- The EIS has underestimated traffic on local roads.

Response

Section 4.2.3 of Appendix H (Technical working paper: Traffic and transport) of the EIS includes a description of how the extents of the operational traffic modelling boundaries were established. This modelling took into account background traffic levels, which are expected to use the road network regardless of whether the M4-M5 Link project is constructed, plus the incremental additional traffic related specifically to other projects. Figure 1 to Figure 6 of Annexure B of of Appendix H (Technical working paper: Traffic and transport) of the EIS show the operational model areas and compares changes in traffic volumes between the 'With project' and 'Without project' scenarios on local roads.

Beyond the extent of the operational modelling area, screenline analysis was undertaken to assess the potential impacts of the project on parallel routes which include key arterial routes beyond the extent of the immediately modelled road network. This includes assessment of the potential impacts of the project on the wider road network including on roads such as Erskineville Road, King Street, Enmore Road and others. Figure 10-1 and Figure 10-2 of Appendix H (Technical working paper: Traffic and transport) of the EIS shows bandwidth plots illustrating the forecast change in daily traffic volumes between the 2023 'With project' and the 'Without project' scenario and 2033 'With project' and the 'Without project' scenario respectively.

In relation to the St Peters interchange, the projects operational performance reviewed a range of network performance measures including intersection performance, travel times, traffic crash potential and public transport service impacts.

The project is designed to improve the motorway network to facilitate traffic movement across the Sydney metropolitan network. Forecast improvements will allow more trips to be made or longer distances travelled on the road network in a shorter time. The forecast increase in vehicle kilometres travelled (VKT) and reduction in vehicle hours travelled (VHT) is mainly due to traffic using the new motorway, with reductions in daily VKT and VHT forecast on non-motorway roads.

The project may see some traffic that currently traverses through local suburbs bypassing these areas through the use of the project. Close to the interchanges, there is potential for some roads to experience increased traffic loads as a result of traffic accessing and egressing from the tunnels. Further details of the modelled traffic impacts on the assessed roads, including how the study area for the operational modelling was determined, are provided in section 8.1 of the EIS and section 9.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS.

A review of operational network performance will be undertaken 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections in proximity to the Wattle Street interchange, Rozelle interchange and St Peters interchange. The assessment will be based on updated traffic surveys at the time and the methodology used will be comparable with that used in this assessment. The results of the review will be considered in future operational network performance planning carried out by Roads and Maritime. See environmental management measure OpTT1 in **Chapter E1** (Environmental management measures).

C8.12.5 Forecast traffic projections

Submitters have raised concerns regarding the traffic projections being optimistic and stated that the number of cars and trucks that actually use newly constructed tunnels can turn out to be much lower than forecast.

Response

The WRTM project model was developed and calibrated to current observed travel behaviour, then validated against 2012 Sydney-wide travel behaviour from a series of traffic count and travel time surveys. Traffic count data is validated to peak times. Driver behaviour on Sydney's toll roads as indicated by the VTTS surveys were used as an input into the model. The VTTS surveys were used to identify drivers' willingness to pay tolls and were undertaken to inform the toll choice modelling to enable the model to best reflect current driver behaviour in the specific context of the WestConnex component projects.

Further information regarding the reliability of the traffic model is provided in **section C8.11.1** and **section C8.12.1** including the use of forecast land use, population and employment data. Further details regarding the traffic projections from the strategic and operational modelling are provided in the Appendix H (Technical working paper: Traffic and transport) of the EIS.

C8.12.6 Travel time saving modelling

Submitters raised concerns as to the accuracy of the travel time saving modelling. Specific concerns include:

- The form and parameters of the model have not been provided
- Travel time for non-motorised modes of transport (cyclists and walking) has not been modelled
- The travel time calculations do not appear to include delays at on-ramps and off-ramps (including delays caused by potential ramp metering)
- Travel time benefit results in Table 8-75 of the EIS are statistically insignificant (less than five per cent), ambiguous or are costs that contradict the purpose of the project ie to reduce congestion and surface traffic flows. Results for the local government areas (LGAs) do not adequately support the need for investment given the opportunity cost of that money.

Response

The parameters of the model are commercially sensitive information. The model is informed by the input data, which in regards to travel times includes:

- Private car driver stated and revealed preference VTTS data collected in Sydney in early 2013
- Commercial vehicle stated preference VTTS data collected in late 2012
- Actual travel times at different times of the day as observed on key routes in the model area through field surveys.

As detailed in **section C8.11.1**, the accuracy of the modelling is considered appropriate and representative of the current and forecast traffic conditions. The traffic model takes into account potential delays at intersections and interchanges. Therefore, movements through entry and exit ramps have been factored into the assessment.

Non-motorised transport (cyclists and pedestrians) is highly variable and cannot be modelled in the same manner as vehicle transport. For example, routes and destinations cannot be easily defined due to the ability of non-motorised transport to take undefinable routes. There are also differences in the ability of people to achieve different travel times based on a large range of factors including age and health. These modes are modelled in the STM but not the WRTM as the latter is only related to road travel.

The improvement in travel times resulting from the 'With project' scenarios will vary depending on the origin and destination of commuters. While the travel time savings may seem small on based on percentages over LGAs, the benefits of these changes will be significant. This can be seen in the changes to VKT and VHT shown in Table 10-1 and Table 10-3 of Appendix H (Technical working paper: Traffic and transport) of the EIS. In 2023 and 2033, with the inclusion of the project, road network productivity is forecast to improve as indicated by a drop in the daily VKT and VHT on the arterial (non-motorway) network, with an increase in kilometres and hours travelled along the motorway routes. Overall, the road network would accommodate more or longer trips in a shorter time.

On routes such as along Iron Cove Bridge and Victoria Road, changes to active transport travel times would be negligible. Improved paths however would improve pedestrian and cyclist safety and amenity. The project would include the provision of new active transport connections, particularly at Rozelle, including two new active transport bridges over City West Link to link the suburbs of Rozelle and Lilyfield with Annandale and an underpass beneath Victoria Road connecting Anzac Bridge to Lilyfield Road rather than the existing bridge over Victoria Road. These active transport links at Rozelle would improve travel time, safety and amenity for cyclist and pedestrians as they enable major road corridors (ie City West Link, The Crescent and Victoria Road) to be crossed more directly. New active transport links for the project would provide connectivity with existing active transport routes. Refer to Chapter 13 (Urban design and visual amenity) and Appendix N (Technical working paper: Active transport strategy) of the EIS for further information regarding active transport to be provided for the project.

Demand management measures are currently being considered by Roads and Maritime to effectively manage peak demand on critical links. These include the use of Smart Motorways (including ramp metering, variable speed limits and lane use management) and arterial management through the re-optimisation of the Sydney coordinated adaptive traffic system (SCATS[1]) to manage the altered traffic patterns that will occur with the introduction of the M4-M5 Link. Such demand management may reduce overall journey time and improve reliability of trips.

C8.12.7 Technical queries regarding the traffic model

Submitters have queried various technical aspects of the traffic model.

Response

The queries made by submitters and a response to each individual query are provided in **Table C8-3**, below.

[1] The Sydney coordinated adaptive traffic system (SCATS) is a traffic management system used to synchronise traffic signals to optimise traffic flow.

Table C8-3 Technical queries relating to the traffic model

Issue description	Response
There is insufficient detail on origin-destination demand matrix generation. What are the form and parameters of the generalised cost function? How were the shorted paths calculated? How are intra-zonal trips modelled?	Refer to the WRTM. Refer to technical documentation on the TPA website[2]. Generalised cost for the WRTM assignment comprises components for travel time, travel distance and tolls paid on those paths that include tolls. Shortest paths are calculated through each iteration of the distributed value of travel time savings multi-user class equilibrium assignment through the algorithms of the traffic modelling software EMME. Forecasts of growth in both inter-zonal and intra-zonal travel is generated through the STM.
What are the travel zones based on? How big are they?	TPA TZ11 definition, derived from analysis of Australian Bureau of Statistics boundaries. These are available on the TPA website[3].
Is the assignment stochastic or deterministic?	The traffic assignment of WRTM is multi-user class equilibrium, static capacity constrained assignment utilising generalised time route choice.
What link loading/flow function was used? What parameters were chosen?	A set of volume-delay functions is used that reflect the relationship between link flow and speed dependent on link class and characteristics.
Impacts on accessibility have not been modelled/assessed	Non-motorised travel is forecast by the STM which provides the source for future growth in travel demands in the Greater Metropolitan Area of Sydney. Pedestrian and bicycle travel times have not been modelled in the WRTM. Despite this, potential impacts to pedestrian and bicycle traffic have been qualitatively assessed in Appendix N (Technical working paper: Active transport strategy) of the EIS. The impact of pedestrian movements on signal phasing and intersection delays for vehicles has been assessed in the detailed operational modelling. Potential impacts to pedestrian and cyclist safety and accessibility, as well as substantial improvements to the active transport network as a result of the project, are discussed in detail in section 8.3 of the EIS for the construction of the project and in section 13.5 of the EIS for the operation of the project.
Were intersection delays included? How?	The volume-delay functions within WRTM incorporate intersection delays as an additional component of link delays using a second additional delay function. The intersection delay component nominally includes deceleration, queuing, gap acceptance, geometric and acceleration delays associated with passing through the intersection at the end of the link.
How are trips to/from external zones modelled?	Cordoned from the STM which covers a wider geography than the WRTM.

[2] http://visual.bts.nsw.gov.au/tz/
[3] www.bts.nsw.gov.au/Statistics/Spatial/default.aspx#tab2

Issue description	Response
Most transport is not an end in itself – it is a means to access work, education, services etc. How does the project affect accessibility?	The project aims to improve accessibility by achieving the following: • Provide an efficient motorway link between the M4 and M5 motorways and improve traffic flow on the motorway network • Enable long term development of the motorway network, including facilitating new cross-harbour capacity and connections to Sydney's south • Improve accessibility and reliability of commercial vehicle movement in the M4 and M5 corridors to economic centres, including to Sydney Airport and Port Botany economic zone • Improve traffic conditions and ease future congestion on the inner western and south-western road network, including Parramatta Road, supporting urban regeneration and growth • Improve overall network productivity.
Why has the weekend period not been modelled, when current weekend traffic volumes are higher than weekday traffic volumes on some parts of the network?	A comparison of weekday and weekend traffic volumes in the study area was undertaken that revealed the peak weekday hourly volumes are similar or higher than the peak weekend hourly volumes. Therefore, the weekday scenario is the worst case traffic situation and is appropriate to be tested as such. This is also standard assessment methodology and consistent with preceding WestConnex assessments. A comparison of peak, daily and weekly traffic volumes on Victoria Road, City West Link and Anzac Bridge, including a comparison of AWT and ADT volumes, is provided in section 5.4.4 and Tables 5-9, to5-11 of Appendix H (Technical working paper: Traffic and transport) of the EIS.
Insufficient detail on trip generation: • What are the form and parameters of the trip production function, and how was it estimated? • What are the form and parameters of the trip attraction function, and how was it estimated? • How were trip productions and trip attractions balanced?	Produced by the STM which is developed and operated by TPA.
Insufficient detail on trip distribution/modal split: • What are the form and parameters of the gravity model used? • What are the form and parameters of the deterrence function used? • How has modal split been estimated?	Produced by the STM which is developed and operated by TPA.
Insufficient detail on public transport assessment:	Produced by the STM which is developed and operated by TPA.

Issue description	Response
• How were access and egress points determined? • How were route strategies determined?	
No sensitivity analysis. How will traffic volumes be affected if/when the willingness to pay for tolls is lower than the estimate used in the model?	As part of the WRTM modelling the following was also undertaken to assess the potential impact so tolling and commuter's willingness to pay and how this might impact traffic distribution: • Available toll choice modelling techniques were assessed in the current Sydney context where multiple competing toll roads cover a substantial portion of the developed Greater Sydney metropolitan area • Project specific VTTS surveys of Sydney drivers' willingness to pay tolls were undertaken to inform the toll choice modelling to enable the model to best reflect current driver behaviour in the specific context of the WestConnex component projects • The results from the VTTS were compared with other similar data from other Australian cities and found to correlate. These have been incorporated into the model to allow tolling influences to be built into the impact assessment. The VTTS parameter values are commercial in confidence. The surveys to identify drivers' willingness to pay tolls revealed a distribution of preferences, where some drivers placed greater value on travel time savings than others. This variability in willingness to pay tolls to save travel time is incorporated into the modelling through the distributed value of travel time savings multi-user class equilibrium assignment.
Insufficient detail on the willingness to pay model	
What are the form and parameters of the model?	
If it was based on stated preference surveys, how has the issue of hypothetical bias been addressed?	
How has the model been validated?	
Does the model include the negative utility of the tunnel environment (monotony, no natural light, air quality)?	
What value of willingness to pay has been used in the WRTM?	
What is the 95% confidence interval around the willingness to pay value used?	
Does the willingness to pay estimate take into account tolls that motorists currently pay (toll saturation)?	There are a number of people in other parts of Sydney who already use multiple toll roads. VTTS surveys capture cost versus time saving and therefore are based on total cost (whether single toll or multiple tolls) and the total network timesaving of the given route. The shortest path building algorithms of the model include all tolls paid on paths between origins and destinations including tolls on existing toll roads.
The assessment of the project only goes until 2033 which does not account for future events that may change travel demands or behaviours.	It is a standard and accepted practice to assess the traffic performance of road infrastructure projects at the forecast year of opening and year of opening plus at 10 years after. The same approach was adopted for the traffic modelling in NorthConnex, M4 East and New M5 EISs. The reliability of modelling decreases beyond 10 years due to the reduced ability to anticipate future modifications to the network and land use patterns that would influence the traffic model.
Equity and equality impacts not described.	A common tolling approach would be applied across all WestConnex motorways (including the introduction of a toll on the M5 East Motorway). See **section C14.9.2** for further detail. Free, alternative traffic routes would remain available to those who choose not to or cannot afford to use the tolled motorway. Concerns regarding equity impacts are addressed in **section C14.9.2**.

Issue description	Response
How many people have better accessibility with the project?	The EIS does not provide a specific assessment of motorist accessibility for the project. Potential impacts to pedestrian and cyclist safety and accessibility, as well as improvements to the active transport network as a result of the project, are discussed in detail in section 8.3 of the EIS.
How many people have poorer accessibility with the project?	
There is no 2033 comparison with the base case.	Yes, this comparison is provided in Appendix H (Technical working paper: Traffic and transport) of the EIS. Traffic modelling for the project assessed eight scenarios which are outlined in section 8.1.5 of the EIS. All future scenarios (with and without the project) assume that other ongoing improvements would be made to the broader transport network including public transport, new infrastructure and intersection improvements to improve road capacity and to cater for traffic growth. The base case is for 2015 and reflects the existing traffic environment. It does not include allowances for likely population, employment and traffic growth in the period through to 2023 and 2033. It is therefore not considered an accurate representation of future traffic conditions and not a valid comparison.
Impacts from other Roads and Maritime projects such as King Street Gateway have not been considered. King Street Gateway is not included in modelling, however it will alter the road geometry and capacity adjacent to the project.	The project considers two cumulative scenarios (2023 and 2033) including other Roads and Maritime projects such as NorthConnex, M4 Widening, M4 East, King Georges Road Interchange Upgrade and the proposed future Sydney Gateway, Western Harbour Tunnel and Beaches Link and F6 Extension projects. While investigations into the King Street Gateway project are underway by the City of Sydney and Roads and Maritime, no confirmed road layout changes or program details were available to inform the technical assessments for the EIS. Therefore, the King Street Gateway project was not considered in the cumulative impact assessment in the EIS (this is explained further in Appendix C (Cumulative impact assessment methodology) of the EIS). The King Street Gateway project would not be precluded by the M4-M5 Link project. Specific design details for the King Street Gateway are not yet available, however this project would impact on surface traffic travelling north-south through Newtown. For commuters making a longer journey through from southern Sydney to the Sydney CBD or northern Sydney, the project would reduce traffic on King Street and assist in enabling the King Street Gateway project.
Does the traffic model incorporate bus lanes on Victoria Road? If these lanes were not modelled as car lanes, the assumed capacity is incorrect	Bus lanes are a traffic lane dedicated to buses, but which can also be used by taxis, bicycles and motorcycles. The traffic model assumed that all existing bus lanes, including on Victoria Road are in place in future year scenarios (2023 and 2033) as they are now. As a result, these lanes were not modelled as car lanes and capacity assumptions are not overstated therefore capacities are not incorrect.

Issue description	Response
The congestion created during construction of WestConnex has not been measured against the reduction in congestion, if any, upon completion	Traffic impacts during construction and operation have been assessed for the project in accordance with the SEARs. As required by the EP&A Act the impacts and benefits of the project would be considered by the NSW Minister for Planning for the determination of the project. When comparing the 'Without project' scenarios to the 'With project' scenarios it was clear that at the year of opening (2023), and 10 years after opening (2033), the congestion alleviation delivered by the project would outweigh the relevant short term construction impacts. Importantly the benefits of the project are felt across the Sydney metropolitan network. Refer to Chapter 7 of Appendix H (Technical working paper: Traffic and transport) of the EIS which provides a detailed analysis of the construction impacts of the project and Chapter 9 and 10 of Appendix H (Technical working paper: Traffic and transport) of the EIS which provides a detailed analysis of the operational impacts of the project.
Failure to estimate how many trips would be avoided if public transport alternatives are available, and what the alternatives might be Failure to clarify the 'With project' scenarios which make them meaningless for assessing the traffic impacts of the project The cumulative operational traffic assessment doesn't include a scenario without Western Harbour Tunnel and Beaches Link	The project is not intended to be an alternative for public transport, rather it is intended to improve services for road transport. It is therefore of no benefit to estimate or compare the project to public transport in terms of trip avoidance or generation. Public transport is assessed as a strategic alternative to the project in section 4.4.2 of the EIS. The 'With project' scenarios are clearly defined in Appendix H (Technical working paper: Traffic and transport) of the EIS. The assessment methodology and assessment criteria are outlined in Chapter 4 of Appendix H (Technical working paper: Traffic and Transport) of the EIS. The intention of a cumulative scenario is to cumulatively assess the project with a range of other projects, including the Western Harbour Tunnel, Beaches Link and F6 Extension projects in 2033. A 2033 'With project' scenario has been assessed without the proposed future Western Harbour Tunnel, Beaches Link and F6 Extension projects in the event that these projects do not proceed within this timeframe.
The traffic modelling in the EIS does not resolve all 'unreleased vehicles' and therefore indicates that the model shows some vehicles to be completely gridlocked. The model assumes demand management to make the model operable but the method is not outlined in the EIS nor are its benefits and costs considered	Unreleased vehicles are an indication of the forecast demand that cannot enter into the modelled road network during the modelled time period. In reality, these vehicles would be queued back outside the model network or they may choose to use different routes or travel at different times. This would also be noted in traffic levels modelled elsewhere in the network. In terms of demand management, measures considered to effectively manage peak demand on critical links would include the use of Smart Motorways (including ramp metering, variable speed limits and lane use management) and arterial management through the re-optimisation of the SCATS to manage the altered traffic patterns that will occur with the introduction of the project.
Traffic that exceeded the free flow capacity of the network was reassigned or 'reduced' to hours outside the peak in the model, an assumption that the submitter believes does not consider the real working hours of	The submission is referring to peak spreading. Peak spreading occurs when congestion during the peak hour means that travel times are extended outside the peak hours or that commuters change behaviour as a result of congestion and plan trips before or after the peak hour effectively spreading the peak over

Issue description	Response
commuters in the industrial areas around St Peters. This results in thousands of unreleased cars at key locations which in reality would result in vehicle queues or network failure	a longer time period.
Traffic modelling does not consider an additional 51,000 vehicles along Euston Road on top of increases in population in the area, and as there is no outlet between the St Peters and Haberfield or Rozelle, all traffic going to the CBD, East or into the Inner West will use local roads	An additional 51,000 vehicles on Euston Road does not have a referenced source. Regardless of comments in relation to population, as outlined in Appendix H (Technical working paper: Traffic and transport) of the EIS, the WRTM includes details of current and forecast population growth over the assessment period including forecast increases in population and employment in the St Peters/Mascot area and wider Sydney metropolitan area. Therefore, the modelling has included consideration of population growth. Most of the increases in traffic on Euston Road are associated with the approved New M5 project and Euston Road, between Sydney Park Road and Campbell Road. Euston Road has been upgraded to accommodate this increased traffic. Only relatively small additional increases of traffic on Euston Road are anticipated as a result of M4-M5 Link. Increased traffic on Euston Road also includes vehicles that are using it instead of the Princes Highway.
The EIS does not set out any trips, desire lines, demand corridors or growth that the project is addressing. Nor is it demonstrated that projections in growth in population and employment correlate to traffic demand increase along the proposed M4-M5 Link	The EIS clearly states the traffic movements that the project is addressing (refer to Chapter 3 (Strategic context and project need) of the EIS). As described in Chapter 8 (Traffic and transport) of the EIS, the WRTM utilises population data to forecast growth rates and employment rates for statistical areas with the Sydney metropolitan area. These are used to forecast traffic trips across all modelled scenarios.
The lack of aggregate measures being provided including: • Overall increase in VKT. • Change in average trip distance. • Change in average trip duration. • Change in total travel time	The overall change to VKT and VHT is calculated in Appendix H (Technical working paper: Traffic and transport) of the EIS for the whole metropolitan network as presented in Tables 10-1 and 10-3 of the EIS, for each LGA as presented in Table 10-4 and for each interchange model network area. Travel time analysis for each interchange model area is presented in Chapter 10 of Appendix H (Technical working paper: Traffic and transport) of the EIS. Due to the large variety of travel routes, departure and destination location and a range of other variables, further aggregate data on these matters has not been provided. However, for transparency, individual road and intersection information is provided in Appendix H (Technical working paper: Traffic and transport) of the EIS from which an aggregate amount could be calculated. Focus has instead been in demonstrating that key routes and locations of the road network have been assessed and overall the project shows a net benefit to the road network.
The existing M5 in peak conditions may provide a more realistic base line for the traffic assessment	Existing and future New M5 Motorway peak hour traffic conditions has been factored into the scenarios where appropriate. The modelling for this project has sought to anticipate and factor in these impacts

Issue description	Response
	into the future year scenarios.
Not identify an outline of 'how this traffic modelling was conducted and what metrics were used for 'future volumes'	**Section C8.11.1** details how input data for the model has been derived including how demographic data and real traffic data has been used to determine the future traffic volumes that went into the model. Future traffic volumes are discussed in Chapter 9 to Chapter 12 of Appendix H (Technical working paper: Traffic and transport) of the EIS.
Figure 7-16 in Appendix H shows the convergence of seven lanes of traffic citybound onto the four lanes of Anzac Bridge. The unconstrained traffic model does not adequately represent the congestion this will cause citybound through the proposed tunnel, on Victoria Road or northwest of the Iron Cove Link	The number of citybound lanes onto Anzac Bridge is as a result of the various direction of travel that will be accessing Anzac Bridge from the Rozelle interchange. The operational model used in this assessment is not unconstrained. It is noted that some queuing is anticipated under the 'With project' scenarios during AM peak hours as commuters try to access the Sydney CBD. This is due to capacity issues within the city rather than on Anzac Bridge as a result of the project. Measures have been proposed to manage potential queuing. Overall, however, travel times are expected to improve under the 'With project' scenarios. The figure showing the lane configuration on Anzac Bridge is Figure 2-5 of Appendix H (Technical working paper: Traffic and transport) of the EIS.
A mesoscopic model, which can provide more a far greater level of detail than the strategic model used would have ensured a more thorough analysis of the networks ability to cope with the traffic predicted. It is not understood why a mesoscopic modelling approach was not undertaken to gain a better understanding of impacts to the surrounding road network.	Due to the size of the project and the variability in network and commuter behaviour, a mesoscopic model would not have been able to assess the network wide implications of the project in the manner that has been undertaken in the EIS. The EIS has used both strategic and micro-simulation modelling to provide an understanding of the impacts of the project on the metropolitan and surrounding road network.
The EIS does not consider the impact of the Sydney Metro West. This project will have a significant impact on travel behaviour (and specifically mode share).	Sydney Metro West was announced by the NSW Government and is planned to link the Parramatta and Sydney's CBDs and serve Sydney Olympic Park and The Bays Precinct along the route. This project is at the early stage of development and has not been included in the future strategic modelling, but is considered in the land use projections as described on page 45 of section 4.2.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS. An explanation for why Sydney Metro West was not included in the cumulative impact assessment for the project is provided in Appendix C (Cumulative impact assessment methodology) of the EIS.
The many new housing developments around Alexandria (eg Ashmore Estate) and the over development of the Australian Technology Park by Mirvac should be included in the traffic modelling because of their significant traffic implications when they are completed.	As detailed in **section C8.12.1**, demographic data from DP&E has been used in the modelling which includes forecast population growth for areas which have been identified for development or redevelopment across the Sydney metropolitan area (refer to section 4.2.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS for further information). Traffic impacts from individual developments at a local scale are a matter for the proponent of those developments and the approving authority.

Issue description	Response
Where the modelling shows traffic beyond capacity at the St Peters interchange resulting in an overloading of the Mascot road network, traffic levels were reduced to fit the modelling.	Traffic levels were not reduced to fit the modelling. When modelling shows congestion the results are reflected in changes to travel times and delays in service. See the response above in this table regarding unreleased vehicles for further information.
Traffic modelling is insufficient because it does not consider the scenarios: • Only Stage 1 of the project is built (ie mainline tunnels) • Only the project is built and no future projects built (ie no Western Harbour Tunnel, F6 Extension or Sydney Gateway projects).	Section 10.6 of Appendix H (Technical working paper: Traffic and transport) of the EIS provides an assessment of Stage 1 operations where the mainline tunnel would be operational without the Rozelle interchange and the Iron Cove Link. Modelled scenarios include a 2023 future year 'project only' scenario which assumes the Western Harbour Tunnel or Sydney Gateway would not be operational and a 2033 future year 'project only' scenario which assumes that the Western Harbour Tunnel and F6 Extension would not be operational.
The modelling uses outdated land use forecasts from the 2014 *A Plan for Growing Sydney.* • The modelling does not consider the latest plans from the NSW Government's Greater Sydney Commission despite them being released nine months ago. • Demand corridors used in the EIS are outdated.	The modelling used forecast population growth data from DP&E. Such information is also utilised by the Greater Sydney Commission which was established by the NSW Minister for Planning. Projects and developments included in the WRTM v2.3 modelling include the strategic directives contained in *A Plan for Growing Sydney* (NSW Government 2014a) in 14 transport and land use corridors including future corridors such as Western Sydney Airport (see **section C8.11.1**). The *Draft Future Transport Strategy 2056* (Greater Sydney Commission 2017) has been released since the exhibition of the EIS. The strategy recognises the roles of motorway connections in providing safe, efficient and reliable movements across the city and identifies WestConnex (including the M4-M5 Link) as an initiative to achieve this.
Submitters mentioned that the criteria used to assess the impact on pedestrians and cyclists was incorrect as it only takes into account distance and not the additional time taken to complete new operational active transport routes.	The project may improve some travel times for pedestrians and cyclists on some routes. On routes such as along Iron Cove Bridge and Victoria Road, changes to travel times would be negligible. Improved paths, however, would improve pedestrian and cyclist amenity. The project would include the provision of new active transport connections particularly at Rozelle, including two new active transport bridges over City West Link to link the suburbs of Rozelle and Lilyfield with Annandale and an underpass beneath Victoria Road connecting Anzac Bridge to Lilyfield Road rather than the existing bridge over Victoria Road. These active transport links at Rozelle would improve travel time, safety and amenity for cyclists and pedestrians as they enable major road corridors (ie City West Link, The Crescent and Victoria Road) to be crossed more directly. New active transport links for the project would provide connectivity with existing active transport routes.

Issue description	Response
Comment that the cross-harbour screenline is positioned too far to the northwest to be relevant. Other screenlines intersect the new roads presented in the project and the cross-harbour screenline needs to be consistent with this approach.	The cross-harbour screenline includes the two cross harbour locations currently available to commuters in the vicinity of the project, being Gladesville Bridge/Victoria Road in the west or the Sydney Harbour Tunnel and Sydney Harbour Bridge in the east. This ensures that the impacts of the project on these existing key crossing points of the harbour are assessed.
The EIS should use more up to date travel to work statistics for Leichhardt – Glebe precinct as the current statistics are from 2011 and the area has changed greatly since then.	The model uses a range of data including the latest available land use and employment forecasts and demographic information from DP&E. Census data from 2016 was not published at the time the traffic modelling was undertaken for the EIS as discussed in **section C8.12.1**.

Further details of the traffic modelling process is provided in section 8.1 of the EIS and Appendix H (Technical working paper: Traffic and transport) of the EIS.

C8.12.8 Induced demand

Submitters objected to the project, stating that the project would attract additional vehicles to the road network (induced demand). Specific objections and queries included:

- The issue of induced demand is acknowledged but has not been adequately addressed in the EIS (and the traffic and transport assessment)
- Induced demand by its nature materialises over several years as people move home/work locations. The EIS does not undertake any long-term evaluation or verification methodology to forecast induced demand
- Increasing road capacity and building urban motorways would not relieve road congestion in the long term, because the added capacity induces more demand
- The assumptions for induced demand used in the traffic modelling are too low
- Roads and Maritime uses its own definition of induced traffic to hide impacts from increased vehicle numbers in the network
- The project would encourage people to use private vehicles
- The project will result in induced demand and congestion at the areas on the edge of the project boundary when traffic flows onto local roads.

Response

Section 4.2.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS acknowledges that traffic growth on new or upgraded roads is generally a result of the following influences:

- Regional increase in number of trips due to population growth and increased economic activity
- Trips attracted from competing routes or modes as a result of improved travel times on the new or upgraded road.

Induced demand as a result of improved travel times between homes and destinations, such as workplaces, shopping centres and education facilities, which cause changes to region-wide trip patterns. Even with no growth in regional population and economic activity, a new or substantially upgraded road can induce changes in trip patterns which then appear as induced traffic demand. The WRTM model incorporates a function that determines induced demand as developed in accordance with international guidance and has been subject to independent review. Induced demand is only one of three sources of traffic growth on new or upgraded roads as outlined in the list above. The WRTM includes the changes in traffic associated with all three of the above sources of traffic, with induced demand equating to about 0.3 per cent additional daily trips in the Sydney metropolitan area in 2033. This is not an interpretation of induced demand developed by Roads and Maritime to hide impacts.

The intent of the project is not to encourage more private vehicle use. The WestConnex program of works is one part of a broader solution to the emerging pressures of population growth, associated urban expansion and density, as well as increasing freight movements. While public transport is also part of this mix, it is recognised that not all trips in Sydney can be served by public transport, especially trips to dispersed destinations or commercial trips requiring the movement of large or heavy goods/materials. A congested road network also affects road-based public transport, increasing bus travel times and journey time variability. The NSW Government is making significant investment in upgrading Sydney's transport infrastructure to address these emerging pressures including investment in motorway, road and public transport projects.

In order to alleviate overall demand, other projects including light rail, metro, bus rapid transit and motorways, provide a multi-modal response to the future challenges. In this context, WestConnex is an enabler of integrated transport and land use planning as it improves accessibility across the Sydney motorway network and reduces congestion on the surface network, in particular on key corridors such as Parramatta Road. As a result, the project supports the development of initiatives including The Bays Precinct and the Parramatta Road Corridor Urban Transformation. The project itself is not intended to reduce demand but rather address current and future growth and congestion on the arterial road network. As detailed above, the project is part of a whole of government response with other public transport projects aimed at increasing capacity of non-road transport options for commuters.

C8.12.9 Request for further modelling and information

Submitters requested specific details be provided for traffic impacts relating to:

- Request for further modelling of areas funnelling towards the airport
- The strategic model (whole system) inputs traffic volumes that simply cannot be accommodated in the road interchanges and feeder routes. Because of the dimensions of vehicles, number of lanes and length of lanes, it is physically impossible to fit that amount of traffic on a road. Request for vehicle density in vehicles per metre of lane during peak hour
- Request for traffic modelling at the following locations:
  - The Anzac Bridge off-ramp to Allen Street/Botany Road
  - The Western Distributor off-ramp to Druitt Street (buses)
  - The Western Distributor off-ramp to Bathurst Street
  - The Western Distributor off-ramp to King Street/Sussex Street
  - Gardeners Road and Botany Road
  - All intersections within the modelled area in the Sydney CBD
- The EIS shows mid-block LoS at interfaces with interchanges and points within the tunnels, there is no information about other mid-block points such as Anzac Bridge. Section 8.3.3 of the EIS refers to increases in daily traffic forecasts on the Anzac Bridge/Western Distributor, particularly in the AM peak, as traffic accesses the M4-M5 Link and future forms of traffic or network management are intended. Information about the traffic forecasts for the Anzac Bridge/Western Distributor should be provided
- Request that the EIS provide an operational road network performance review to demonstrate an improved road network as stated in the EIS. Included should be a 10 year assessment to understand longer term road impacts of the project
- Concern that the EIS does not contain evidence of how the project will reduce traffic accidents and vehicle operating costs
- An analysis of current traffic volumes at 9.00 am, noon and 3.00 pm on Victoria Road adjacent to Rozelle Public School, and projected traffic analysis for school days both on Victoria Road adjacent to the school, and for both a tolled and toll-free Iron Cove Link tunnel adjacent to the school, at 9.00 am, noon and 3.00 pm, by diesel and non-diesel engine type.

Response

Submitters requested further modelling of routes around Anzac Bridge and the Western Distributer. An assessment of the potential traffic and transport impacts from the project on roads around the Rozelle interchange, including Anzac Bridge, is provided in section 10.4 (for the 'With project' scenario) of Appendix H (Technical working paper: Traffic and transport) of the EIS and is based on traffic modelling. Management and mitigation measures specific to traffic and transport impacts on Anzac Bridge are included in section 11.2.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS. This modelling describes network conditions for most of the locations identified by submitters.

Anzac Bridge and the Western Distributor, like other travel demand corridors in the study area, are amongst the most highly congested road corridors in Sydney, with demand already exceeding capacity during peak periods, particularly eastbound in the morning peak hour due to the existing operational and geometric features of the road network. The assessment found that by 2023, comparing the 'With project' scenario to the 'Do minimum' or 'Without project' scenario:

- There is a substantial increase in overall forecast traffic demand in this area during the AM peak hour due to the new connectivity being provided by the Rozelle interchange, with eastbound congestion issues on the Western Distributor, mainly due to downstream exit blocking from Sydney Harbour Bridge. Congestion on the Western Distributor and across Anzac Bridge in the eastbound direction is forecast to cause queuing and delays on City West Link and Victoria Road and, for brief periods, the M4 eastbound exit ramp and the Iron Cove Link ramp to Anzac Bridge. Approaches to address this are discussed in the mitigation section. Refer to Chapter 12 of Appendix H (Technical working paper: Traffic and transport) of the EIS

- In the PM peak hour, there are travel time improvements in the peak westbound direction towards City West Link and Victoria Road due to the Iron Cove Link and M4 Motorway connectivity. There are also forecast eastbound delays on the same roads caused by forecast traffic demand increases to Sydney Harbour Bridge.

By 2033, comparing the 'With project' scenario to the 'Do minimum' or 'Without project' scenario:

- In the AM peak period, Anzac Bridge/Western Distributor is more congested eastbound because of a forecast increase in demand due to the new connectivity being provided by the Rozelle interchange. As in 2023, eastbound movements are mainly affected by the downstream exit blocking from Sydney Harbour Bridge. Congestion on the Western Distributor and across Anzac Bridge is forecast to cause delays and queues on City West Link and Victoria Road, as well as the M4 East exit ramp and the Iron Cove Link ramp to Anzac Bridge. Approaches to address this are discussed in the mitigation section. Refer to Chapter 12 of Appendix H (Technical working paper: Traffic and transport) of the EIS
- In the PM peak period, the modelled road network with the project performs better than the 'Without project' scenario, especially westbound from the Sydney CBD, due to the introduction of free flow connections from Anzac Bridge to the M4 East and Iron Cove Link. There is large unreleased demand on the Western Distributor (as in the base case), The Crescent and Johnston Street by the end of the peak hour. This indicates that vehicles are likely to struggle to enter the modelled network in the peak hour.

Roads and Maritime is developing a strategy to ensure appropriate network integration in the areas surrounding the Rozelle interchange (see environmental management measure OpTT3 in **Chapter E1** (Environmental management measures)), including:

- Capacity improvement measures – a number of areas have been identified for investigation to improve capacity including the intersection of the Western Distributor and Pyrmont Bridge Road at Pyrmont, the merge and weave arrangements on the Western Distributor close to Darling Harbour, modifications through the use of moveable medians on the approaches to the Sydney Harbour Bridge and a review of kerbside use of the road network at the interfaces with the Western Distributor to remove key bottlenecks and allow additional capacity where appropriate
- Project staging options – effective staging of the opening of major projects would also keep forecast demands closer to capacity and adjustments to current staging and program timelines for major projects with the surrounding network may be required. Investigations are underway by Roads and Maritime to determine the effect and viability of altering key project timelines to achieve the best road network performance. This may include timing projects to reduce 'spikes' in the forecast demand that would exceed capacity operation and ensure effective control of traffic. As many of these projects are still in development, the requirements for staging are yet to be determined
- Demand management measures – demand management measures are being considered to effectively manage peak demand on critical links. These include the use of Smart Motorways (including ramp metering, variable speed limits and lane use management) and arterial management through the re-optimisation of the SCATS to manage the altered traffic patterns that will occur with the introduction of the project.

Specific measures will be identified as investigations progress and their implementation will depend on their complexity and appropriate timing to minimise impact on the community. Roads and Maritime will carry out these investigations in consultation with councils and DP&E to develop a program of works.

Traffic modelling provided in Appendix H (Technical working paper: Traffic and transport) of the EIS does not describe detailed changes within the Sydney CBD. Due to the small forecast change in the Sydney CBD with the project and the complexity of the Sydney CBD traffic operations, it was not considered appropriate to model the operation of intersections or streets in the Sydney CBD. The forecast daily traffic demand changes can be seen in Figure 10.1 and 10.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS and the forecast AM and PM peak hour traffic demand changes can be seen in Figure 3 and Figure 4 of Annexure B of Appendix H (Technical working paper: Traffic and transport) of the EIS. These figures illustrate that the main changes are focused on the Western Distributor/Sydney Harbour Bridge and Sydney Harbour Tunnel/Eastern Distributor, with minimal changes forecast within the Sydney CBD, and therefore do not merit additional modelling.

Some submitters question the level of modelling in and around Sydney Airport and requested more information in regards to key road connections to Sydney Airport. It is considered that an appropriate level of assessment has been undertaken near the Sydney Airport in proximity to the St Peters interchange. Figure 4-4 of Appendix H (Technical working paper: Traffic and transport) of the EIS outlines the model boundary in this location. As can be seen, key roads and intersection have been included, including the Princes Highway, Gardeners Road, Campbell Street, Euston Road, Bourke Road and others. Changes on strategic roads outside of the study area are assessed in the Sydney metropolitan road network sections and those outside the operational model areas are assessed through a screenline analysis, presented in section 12.2 and Chapter 9 of Appendix H (Technical working paper: Traffic and transport) of the EIS, respectively.

Gardeners Road and Botany Road are included within the traffic model boundary as shown in Figure 4-4 of Appendix H (Technical working paper: Traffic and transport) of the EIS. Botany Road is included in the screenline analysis in section 9.5.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS.

The M4-M5 Link would connect to the proposed future Sydney Gateway via the St Peters interchange, which would improve connectivity between Sydney's international gateways (Sydney Airport and Port Botany), western Sydney and places of business across the Sydney region. As the Sydney Gateway is in the early planning stages, it was conservatively assumed to be operational by 2023 for the purpose of the EIS, including the traffic modelling and assessment.

Should the Sydney Gateway project be delayed for a significant length of time, it is expected that both the New M5 Road Network Performance Review Plan (conditioned as part of the New M5 approval) and the proposed M4-M5 Link Road Network Performance Review, would confirm the operational traffic impacts of the projects on surrounding arterial roads and major intersections. These reviews would examine potential management measures as identified in the Road Network Performance Review to improve performance following the collection of data that would facilitate a clearer understanding of actual project impacts. Refer to section 11.2.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS which lists intersections which would be assessed as part of the network performance review. The EIS also identifies the intersections where mitigation measures may be required should the Sydney Gateway be delayed.

Submitters requested that a traffic review be undertaken of the operational road network following opening. A review of operational network performance will be undertaken 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections in proximity to the Wattle Street interchange, Rozelle interchange and St Peters interchange. The assessment will be based on updated traffic surveys at the time and the methodology used will be comparable with that used in the EIS assessment. The results of the review will be considered in future operational network performance planning carried out by Roads and Maritime (see environmental management measure OpTT1 in **Chapter E1** (Environmental management measures)).

This is consistent with requirements for other major road and motorway projects including NorthConnex, M4 East and New M5. Beyond this, interfacing projects such as the proposed future Sydney Gateway, F6 Extension and Western Harbour Tunnel, would also be expected to undertake similar operational network performance reviews, if they are approved.

Some submitters requested detail of how the project would reduce traffic crashes. A traffic crash analysis for the project is presented in section 10.2.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS. These crashes would be balanced against the reduction in crashes forecast by the reduction in traffic volumes on the surface roads. With crash rates on motorways much lower than on surface arterial roads (due to free flow ie less stop-start conditions and less congestion), a general reduction in accidents would be expected. Similarly, there would be an expected decrease in the cost to vehicle owners associated with the reduction in traffic volumes on surface roads along some key routes and a reduction of start-stop conditions associated with congestion.

A submitter has requested an analysis of current traffic volumes at 9.00 am, noon and 3.00 pm on Victoria Road adjacent to Rozelle Public School, and projected traffic analysis for school days both on Victoria Road adjacent to the school, and for both a tolled and toll-free Iron Cove Link tunnel adjacent to the school, at 9.00 am, noon and 3.00 pm, by diesel and non-diesel engine type. The traffic analysis in the EIS includes AM and PM peak hours incorporating existing traffic data and forecasts based on times outside school holidays. Times outside these peak hours would have lower traffic levels and therefore less congestion negating the need for further assessment. Similarly, the modelling incorporates the project's proposed tolling regime. No toll is proposed on the Iron-Cove Link.

C8.13 Performance of mainline tunnels during operation

Six submitters have raised issues regarding the performance of the mainline tunnels during operation. Refer to section 8.3 of the EIS for details of potential operational traffic and transport impacts.

Submitters raised concerns about the performance of the mainline tunnels during operation. Specific concerns included:

- Concern that the tunnels have built-in bottlenecks within the tunnel that will hamper their performance from day one
- Concern about traffic backing up into the tunnels from bottlenecks downstream of the tunnels.

Response

When capacity is reached at a part of a road network, it can behave as a bottleneck, reducing traffic flow at downstream locations, with increased delays at points upstream. The project as described in the EIS has been designed to minimise the potential for bottlenecks to occur, particularly within tunnels. This has been achieved through reducing the need for merging or weaving which can slow traffic.

In addition to design features, the management of traffic both within the tunnels, and on surface roads will allow the potential for bottlenecking within the tunnels to be reduced. Signal timing and adaptive speed management can reduce vehicles entering potentially congested parts of the network and therefore reduce congestion, thereby reducing the likelihood that flow breakdown will occur. Levels of service around project interchanges during operation are provided in Chapter 8 of Appendix H (Technical working paper: Traffic and transport) of the EIS.

C8.14 Operational impact on network performance

1068 submitters have raised issues regarding the performance of the road network during operation. Refer to section 8.3 of the EIS for details of potential operational traffic and transport impacts.

C8.14.1 Operational network performance

Submitters raised general concerns relating to the operational road network performance with the project. In summary, the submitters raised the following issues:

- General concern that the project would not assist in resolving Sydney's traffic congestion issues
- Submitters raised concerns regarding traffic congestion impacts in the following areas and on the following roads: Sydney CBD, Newtown, Ashfield, Haberfield, Darley Road, Balmain, King Georges Road, Enmore, Alexandria, Erskineville, Forest Lodge, Glebe, Bridge Road, Wattle Street and Western Distributor
- Specific concern for additional congestion near tunnel portals
- Traffic at Darley Road will increase by four per cent following completion of the project
- The predicted shorter journey times on the tollway sections will be countered by increased traffic and congestion on the feeder [arterial] roads
- Connecting roads will not have available capacity to meet the predicted traffic discharge
- Submitter raised concerns about traffic congestion on Parramatta Road if the Parramatta Road Corridor Urban Transformation project is not completed and how this will funnel motorists onto the toll roads
- Concern that the project will degrade intersection performance around the project footprint.

Response

The project would provide a motorway standard tunnel connection between the M4 and M5 motorways, as an alternative to congested arterial roads. The addition of the M4-M5 Link would provide a significant improvement to the traffic network, with an overall increase in daily VKT and a forecast reduction in daily VHT on the road network. This means that more trips could be made or longer distances travelled on the network in a shorter time, mainly due to traffic using the new motorway, with reductions in daily VKT and VHT forecast on the non-motorway roads. This indicates the additional network capacity provided by the project would assist in accommodating the forecast growth in population and travel demand that would otherwise contribute to worsening road network and traffic conditions without the project. The modelling for the project shows that for the 'With project' scenarios, surface roads in the inner west would experience a reduction in VKT and VHT and improved average speeds.

Appendix H (Technical working paper: Traffic and transport) of the EIS includes an assessment of the predicted operational traffic impacts of the project on the road network. The road network in the study area currently functions under high levels of traffic demand that often exceeds the operational capacity, especially city bound during the AM peak period. The study area includes some of the most highly congested road corridors in Sydney. Major routes in the study area, such as Parramatta Road, City West Link, Victoria Road, Anzac Bridge/Western Distributor, Southern Cross Drive, the Princes Highway and King Street, all experience significant congestion with resultant increase in travel time and variability, which can cause typical morning and evening peak hours to spread over longer periods, and extend the peak period.

The M4-M5 Link motorway is forecast to operate at a good LoS in the 2023 and 2033 'With project' scenarios, with levels of service between LoS A and LoS D (depending on the section of the motorway) during the AM and PM peak periods and with average speeds of 75-80 kilometres per hour.

Key benefits forecast for the Sydney metropolitan road network as a result of the M4-M5 Link project include:

- Existing non-motorway (arterial and local) roads in the Inner West LGA are forecast to experience faster trips with the daily average speed increasing. Similarly, the vehicle distance travelled on non-motorway roads is forecast to reduce. This indicates that on average, these trips would be fewer in number and faster
- Reduced travel times are forecast on key corridors, such as between the M4 Motorway corridor and the St Peters interchange
- Reduced traffic forecast on sections of major arterial roads including City West Link, Parramatta Road, Victoria Road (Rozelle), King Street (Newtown), Sydenham Road and King Georges Road.

As a result of the additional road network capacity provided by the project, the two-way future year average weekday traffic demand compared to a 'Without project' scenario is predicted to significantly decrease on:

- City West Link and Parramatta Road at Haberfield, east of the M4 East Wattle Street and Parramatta Road ramps respectively, by about 25 per cent in the 2023 and 2033 'With project' and 'Cumulative' scenarios
- King Street at Newtown by about 20 per cent in the 2023 and 2033 'With project' scenarios
- Stanmore Road at Stanmore by about 15 per cent in the 2023 and 2033 'With project' and 'Cumulative' scenarios
- Lyons Road at Russell Lea by about 15 per cent in the 2023 and 2033 'With project' scenarios, and about 20 per cent in the 2023 and 2033 'Cumulative' scenarios
- Southern Cross Drive and the Sydney Harbour Tunnel by about 20 per cent and 25 per cent respectively in the 2023 and 2033 'Cumulative' scenarios.

A summary of the forecast changes to VKT and VHT that the project may generate is provided in **Table C8-4**.

Table C8-4 Comparison of daily VKT and VHT for metropolitan Sydney under future scenarios

Scenario	Year	Daily VKT ('000 km)			Daily VHT ('000 hours)		
		Motorway	Other	Total	Motorway	Other	Total
Base case	2015	23,940	74,810	98,750	400	2,520	2,920
Do minimum (Without project)	2023	26,880	86,520	113,400	470	3,160	3,630
With project		27,730	86,050	113,780	480	3,120	3,600
Cumulative		27,980	85,970	113,950	470	3,110	3,570
Do minimum (Without project)	2033	31,030	101,900	132,930	590	4,670	5,560
With project		32,010	101,410	133,430	600	4,610	5,220
Cumulative		33,780	100,650	134,420	600	4,500	5,100

Source: WRTM v2.3, 2017

There are significant reductions in forecast daily traffic volumes along Balmain Road, Victoria Road (south of the proposed Iron Cove Link), King Georges Road, Stanmore Road, Addison Road and Sydenham Road compared to the 'Without project' scenario. Table 10-2 of the EIS presents the percentage changes in daily VKT, VHT and average speed in 2023 with the project on non-motorway links in the LGAs closest to the project including:

- Bayside
- Burwood
- Canada-Bay,
- Canterbury-Bankstown
- Inner West
- Strathfield
- Sydney.

The average speed would vary by time of day and by road type. The forecast percentage changes indicate that, apart from Bayside, all other LGAs either benefit from reduced traffic on surface roads or there is no forecast change. The increase in VKT and VHT in Bayside LGA is due to forecast increases in daily traffic on surface roads between the St Peters interchange and Sydney Airport, in the absence of Sydney Gateway.

Daily traffic volumes on Darley Road would slightly increase by around one per cent in 2023 and 2033. A decrease in the daily volume of heavy vehicles on surface roads is also forecast, as heavy vehicles shift onto the M4-M5 Link. Daily heavy vehicle volumes on Parramatta Road and City West Link are forecast to drop by 40 to 50 per cent, and on roads in the inner west, such as Stanmore Road, Sydenham Road, Marrickville Road and King Street, are forecast to drop by 20 to 50 per cent.

There is concern that the project will cause congestion around tunnel portals. See **section C8.15** to **section C8.17** for a more detailed analysis of the potential impact to the road network, both intersection and mid-block impacts, around each of the three interchange locations. The assessment identifies that while there may be congestion in the immediate vicinity of the interchanges, there would be an overall benefit to the wider road network.

With the inclusion of the M4-M5 Link, the WRTM is forecasting reductions in peak period travel times between the M4 corridor and the Sydney Airport/Port Botany precinct in 2023 and 2033, with traffic shifting from the A3 (King Georges Road) corridor to the M4-M5 Link. This is outlined in **Table C8-5**.

Table C8-5 Comparison of average peak travel time savings

Trip	2023 'With project' average peak travel time saving		2033 'With project' average peak travel time saving	
	Compared to 2023 'Without project'	Compared to a scenario without WestConnex (mins)	Compared to 2033 'Without project'	Compared to a scenario without WestConnex (mins)
Between Parramatta and Sydney Airport	10	25	10	30
Between Burwood and Sydney Airport	5	15	5	20
Between Silverwater and Port Botany	10	15	10	20

Source: WRTM v2.3 2017

Some improvement in travel times between the Victoria Road corridor and the Sydney Airport/Port Botany precinct are also forecast in the 2023 'With project' scenario.

As discussed above, road network productivity is forecast to improve in 2033, with the inclusion of the project. There is a drop in the daily VKT and VHT on the arterial (non-motorway) network with an increase in kilometres and hours travelled along the motorway routes, as seen in **Table C8-6**. The addition of the M4-M5 Link provides a significant overall benefit to the network where more or longer trips could be made on the road network in a shorter time.

Table C8-6 Comparison of daily 2033 VKT and VHT for metropolitan Sydney in 'Without project' and 'With project' scenarios

Scenario	Daily VKT ('000 km)			Daily VHT ('000 hours)		
	Motorway	Other	Total	Motorway	Other	Total
Do minimum (Without project)	31,030	101,900	132,930	590	4,670	5,560
With project	32,010	101,410	133,430	600	4,610	5,220

Source: WRTM v2.3 2017

Where the project would connect to the existing road network, increased congestion is forecast in parts of Mascot, along Frederick Street at Haberfield, Victoria Road north of Iron Cove Bridge, Johnston Street at Annandale and on the Western Distributor. Many of these areas would be improved when the project is completed and the proposed future Western Harbour Tunnel and Beaches Link program of works and Sydney Gateway project, if approved, are completed.

The implementation of the *Parramatta Road Corridor Urban Transformation Strategy* is outside the scope of this project. However, the project would reduce traffic on Parramatta Road (east of Haberfield) and a similar reduction in traffic on Parramatta Road to the west of Haberfield is proposed as a result of the M4 East project, which is under construction. The forecast traffic reductions on Parramatta Road as a result of the M4-M5 Link are around 25 per cent in 2023 and 2033 (refer to Table 9-1 of Appendix H (Technical working paper: Traffic and transport) of the EIS). The reduction in traffic and providing associated capacity for initiatives such as upgrading public transport services and improving the urban amenity of the public realm on Parramatta Road is a key component of achieving this strategy.

Management of potential impacts – operational

The management of operational traffic and transport impacts would be focused around the interchanges at Wattle Street, Rozelle and St Peters. As with the M4 East and New M5 projects, Roads and Maritime would undertake a Road Network Performance Review, in consultation with Transport for NSW and relevant councils. This would confirm the operational traffic impacts of the M4-M5 Link on surrounding arterial roads and major intersections at both 12 months and five years after opening of the project. The assessment would be based on future updated traffic surveys taken during operation utilising an appropriate methodology following the relevant and industry accepted guidelines current at the time (see environmental management measure OpTT1 in **Chapter E1** (Environmental management measures)).

Regardless, those areas that have been identified as being potentially impacted by the project have been identified in Appendix H (Technical working paper: Traffic and transport) of the EIS and would be addressed prior to these operational reviews, or as needed.

To manage potential performance constraints at the Wattle Street interchange, Roads and Maritime will investigate the implementation of the following in consultation with local councils:

- Queuing and capacity monitoring and management on the Frederick Street/Milton Street corridor
- Managing lane use and utilisation to improve the operation of the corridor (see environmental management measure OpTT2 in **Chapter E1** (Environmental management measures)).

Roads and Maritime will also develop a strategy (see environmental management measure OpTT3 in **Chapter E1** (Environmental management measures)) to ensure appropriate network integration in the areas surrounding the Rozelle interchange. The strategy will include a review of:

- Capacity improvement measures
- The interface with road based public transport on the Western Distributor and Victoria Road in consultation with Transport for NSW
- Project staging options
- Demand management measures.

Submitters also questioned traffic impacts to the Sydney CBD as a result of the project. The assessment of forecast traffic showed that there would be no material change in traffic volumes in the Sydney CBD as a result of the project, as shown in Figure 10-1 and Figure 10-2 in Appendix H (Technical working paper: Traffic and transport) of the EIS.

C8.14.2 Congestion at entry and exit ramps

Submitters raised concern that there will be congestion and backing up of traffic at entry and exit ramps. In particular, submitters were concerned that there will be congestion at the tunnel entrances/exits at Haberfield. Specific concerns include:

- The tunnel portals will be major sites for traffic congestion
- Any congestion on exits has the capacity to negate all travel time savings to the exit point, given the small predicted benefits.

Response

Detailed assessments for the concept design described in the EIS have been undertaken to ensure that queuing on the tunnel exit ramps would not extend into or impact on the mainline tunnel. Design of surface road approaches to the ramps has been undertaken to minimise the need for weaving and merging of traffic on approach to the tunnel. Refer to Chapters 4 and 5 of the EIS, which provide a detailed description of the project and how the design was developed and alternatives considered, including how the design would minimise weaving.

The traffic assessment forecasts that the majority of the project's on and off ramps would operate in free flow conditions. This includes on the M4-M5 Link exit ramps at the Wattle Street interchange. The predicted congestion on the Western Distributor and Anzac Bridge is forecast to cause some queueing back into the Iron Cove Link, and to a lesser extent on the M4 East to Anzac Bridge exit ramp during the AM peak hour when comparing both 2023 and 2033 'With project' scenarios (refer to section 10.4.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS). In the PM peak hour, westbound traffic movements would be free flowing, however for the eastbound movements the downstream capacity is constrained at Sydney Harbour Bridge, causing eastbound flow breakdown on the Western Distributor and Anzac Bridge. This is expected to cause significant delays across Anzac Bridge, with queuing extending back onto Victoria Road and City West Link. This queueing is not forecast to extend back to the M4-M5 Link mainline tunnels.

A review of operational network performance will be undertaken 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections in proximity to the Wattle Street interchange, Rozelle interchange and St Peters interchange. The assessment will be based on updated traffic surveys at the time and the methodology used will be comparable with that used in this assessment. The results of the review will be considered in future operational network performance planning carried out by Roads and Maritime. See environmental management measure OpTT1 in **Chapter E1** (Environmental management measures)).

Measures that Roads and Maritime would investigate to manage potential performance constraints at the Wattle Street interchange are described in **section C8.14.1**.

Once operational, additional demand management measures would be implemented (if shown to be needed) to address congestion including at entry and exit ramps. Demand management measures are being considered to effectively manage peak demand on critical links. These include the use of Smart Motorways (including ramp metering, variable speed limits and lane use management) and arterial management through the re-optimisation of the SCATS to manage the altered traffic patterns that will occur with the introduction of the M4-M5 Link project.

C8.14.3 Moving bottlenecks to new locations

Submitters have expressed concern that instead of mitigating traffic issues, the project and associated surface work would move the bottleneck elsewhere. These bottlenecks will be on roads and bridges which are not equipped to carry the projected increase of traffic.

Response

The nature of traffic management, particularly when assessing elements of a road network that is congested, is that when congestion is alleviated in one part of the network vehicles can then access other parts of the road network quicker. As a result, congestion points can move.

Without the project, and as shown in Chapter 8 of Appendix H (Technical working paper: Traffic and transport) of the EIS, there is a forecast growth in overall travel demand, due to a forecast increase in population and employment. This would cause increased congestion levels on the road network regardless of the project. A reduction in daily traffic is forecast along Parramatta Road (west of the M4 East Parramatta Road ramps) in 2023 and 2033 as a result of the M4 East project, and on the M5 East as a result of the New M5 project.

The project would connect to the M4 East at Haberfield and the New M5 at St Peters and would provide future connections to the proposed future Western Harbour Tunnel and Beaches Link program of works and the Sydney Gateway project. The Wattle Street interchange, Rozelle interchange and St Peters interchange would also allow motorists to connect to the arterial road network at the surface.

The addition of the M4-M5 Link provides a significant overall improvement to network productivity. As shown in **Table C8-1**, an overall increase in daily VKT and a reduction in daily VHT on the road network are forecast. The forecast increase in VKT and reduction in VHT is mainly due to traffic shifting to the new motorway, with reductions in daily VKT and VHT forecast on the non-motorway roads. This indicates the additional network capacity provided by the project would assist in accommodating the forecast growth in population and travel demand that would otherwise contribute to worsening road network and traffic conditions without the project. This trend continues in the cumulative scenario, with reduced daily VKT and VHT forecast for the non-motorway roads.

Table C8-1 Comparison of daily VKT and VHT for metropolitan Sydney under future scenarios

Scenario	Year	Daily VKT ('000 km)			Daily VHT ('000 hours)		
		Motorway	Other	Total	Motorway	Other	Total
Base case	2015	23,940	74,810	98,750	400	2,520	2,920
Do minimum ('Without project')	2023	26,880	86,520	113,400	470	3,160	3,630
With project		27,730	86,050	113,780	480	3,120	3,600
Cumulative		27,980	85,970	113,950	470	3,110	3,570
Do minimum ('Without project')	2033	31,030	101,900	132,930	590	4,670	5,560
With project		32,010	101,410	133,430	600	4,610	5,220
Cumulative		33,780	100,650	134,420	600	4,500	5,100

The M4-M5 Link is not intended to resolve existing performance across the entire Sydney road network. To the extent that work may be required to address trouble spots and bottlenecks, the relevant roads authority (either Roads and Maritime or the relevant local council) would consider necessary works as a separate project(s) at the relevant time.

Chapter E1 (Environmental management measures) includes environmental management measures designed to avoid, minimise or manage impacts on the road network, including impacts associated with forecast increases in traffic volumes along routes adjacent to the traffic and transport study area.

Appendix H (Technical working paper: Traffic and transport) of the EIS acknowledges that management of operational traffic and transport impacts around the three interchanges at Wattle Street, Rozelle and St Peters would be required. As with the M4 East and New M5 projects, Roads and Maritime would undertake a Road Network Performance Review, in consultation with Transport for NSW and relevant councils. This would confirm the operational traffic impacts of the M4-M5 Link on surrounding arterial roads and major intersections at both 12 months and five years after opening of the project. The assessment would be based on future updated traffic surveys taken during operation utilising an appropriate methodology following the relevant and industry accepted guidelines current at the time. Regardless, those areas that have been identified as being potentially impacted by the project have been identified in Appendix H (Technical working paper: Traffic and transport) of the EIS and would be addressed prior to these operational reviews, or as needed.

C8.14.4 Submissions supporting the improved network performance

One submitter noted that the project will improve network performance following completion of construction phase. They noted that travel times and congestion will improve.

Response

The support for the improved network performance, travel times and congestion as a result of the project is noted.

C8.15 Operational impact on network performance – Wattle Street interchange and surrounds

204 submitters have raised issues regarding the impact of the Wattle Street interchange on the operational traffic network performance. Refer to section 8.3 of the EIS for details of potential operational traffic and transport impacts.

C8.15.1 Impact on network performance

Submitters raised concerns regarding network performance around the Wattle Street interchange and surrounds. Specific concerns included:

- Concern about roads around Haberfield
- Concern that Parramatta Road will be gridlocked for four to five hours twice a day
- Concern about the congestion the project will create on Frederick Street
- Concern about the LoS of the mid-block on Parramatta Road being forecast to drop to LoS E
- Concern that WestConnex will cause intersection failure at intersections along City West Link and Wattle Street
- Concern that there is no accurate information on how Haberfield will be impacted long term.

Response

The project provides additional road capacity and part of it runs parallel to City West Link with connections at the Wattle Street interchange and the Rozelle interchange. As a result of the additional road network capacity provided by the project, the two-way future year AWT traffic demand compared to a 'Without project' scenario is predicted to significantly decrease on City West Link and Parramatta Road, east of the M4 East Wattle Street and Parramatta Road ramps respectively. Traffic demand would decrease by about 25 per cent in the 2023 and 2033 'With project' and 'Cumulative' scenarios.

The modelling did not forecast operational intersection failure at intersections along City West Link and Wattle Street as a result of the project. For the 2023 and 2033 'With project' scenarios, LoS at key intersections along Parramatta Road and along City West Link and Wattle Street around the Wattle Street interchange are expected to be maintained, with the exception of the Parramatta Road/Wattle Street intersection.

Further detail regarding the impact of the project on the operational network performance at the Wattle Street interchange and surrounds is provided below.

Future conditions without the project – Wattle Street interchange and surrounds

With forecast traffic growth, the network performance at Haberfield around the Wattle Street interchange without the project is forecast to deteriorate over time. This part of the road network is forecast to be unable to accommodate the future traffic demands, with slow average speeds (less than 15 kilometres per hour) and queuing forecast during peak periods by 2033.

The forecast traffic demand results in increased congestion along Dobroyd Parade, Parramatta Road and Frederick Street in the future. Intersection performance is expected to be an issue in the vicinity of the Wattle Street interchange, such as at the Parramatta Road/Wattle Street and Parramatta Road/Liverpool Road intersections.

Future conditions with the project – Wattle Street interchange and surrounds

In 2023, comparing the 'With project' scenario to the 'Do minimum' or 'Without project' scenario:

- The impacts in the AM peak period are positive with travel times improving compared to 'Without project' conditions. The number of vehicles on the surface road network is reduced as a result of traffic shifting to the M4-M5 Link, with subsequent benefits to the surface traffic network
- The network is also expected to undergo general improvement in performance in the PM peak when compared to 'Without project' conditions, with vehicles travelling eastbound on Parramatta Road and citybound on City West Link experiencing the greatest benefits. As in the 'Without project' scenario, demand for Frederick Street southbound remains high and so travel times along this section of the network remain long with queuing back along Wattle Street.

In 2033, comparing the 'With project' scenario to the 'Do minimum' or 'Without project' scenario:

- In both AM and PM peak hours, the 'With project' scenario is forecast to better accommodate anticipated increases in demand than the 'Without project' scenario, with intersection and network performance improvements across this part of the road network, although parts of the network are forecast to still experience congestion.

In both 2023 and 2033, comparing the 'Cumulative' scenario to the 'With project' scenario, there are relatively minor changes in network performance, with the exception of a reduction in queuing and delays from Frederick Street to City West Link, as a result of a reduction in forecast demand to City West Link. These forecasts show that the project would not result in AM and PM peaks of four to five hour durations. The forecast out to 2033 provides an acceptable forecast period with any greater forecast period becoming unreliable.

The analysis has identified key constraints impacting the performance of the network on Frederick Street (southbound), Parramatta Road (eastbound) and City West Link (citybound) in the 'Without project' scenario. The forecast congestion on Parramatta Road and City West Link are generally reduced by the M4-M5 Link project, particularly in 2023. It is expected that the M4 East Road Network Performance Review would examine potential management measures following the collection of updated (post-opening) data that would facilitate an understanding of actual project outcomes and update management measures, if necessary.

Notwithstanding the above, Roads and Maritime proposes to investigate the identified exit blocking from Frederick Street through the Parramatta Road/Wattle Street intersection in the 'With project' scenario. The exit blocking arises from forecast increase in southbound traffic demand, combined with capacity restrictions at downstream intersections and limited storage space on Frederick Street. Management measures to be investigated, in consultation with relevant local councils, may include:

- Queuing and capacity monitoring and management on the Frederick Street/Milton Street corridor
- Managing lane use and utilisation to improve the operation of the corridor.

C8.15.2 Submissions in support of the project

Submitter believes the project will solve congestion issues in conjunction with the M4 East project.

Response

The support for the project solving congestion issues in conjunction with the M4 East project is noted.

C8.16 Operational impact on network performance – Rozelle interchange and surrounds

1449 submitters have raised issues regarding the impact of the Rozelle interchange on operational traffic network performance. Refer to section 8.3 of the EIS for details of potential operational traffic and transport impacts.

C8.16.1 Impact on network performance

Submitters raised concerns that the network performance around the Rozelle interchange would be impacted. Specific concerns include:

- Concerns regarding network performance impacts on the following roads: Lilyfield Road, Anzac Bridge, Victoria Road, City West Link, Ross Street, Gladesville Bridge, Johnston Street, Catherine Street, Victoria Road at Drummoyne, The Crescent, Johnston Street and James Craig Road
- The traffic lights at the tunnel entry/exit at City West Link at Rozelle will cause congestion
- Many intersections will worsen as a result of the Rozelle interchange (at the worst case scenario of LoS F) or remain unchanged, particularly in 2033, including the following intersections:
  - Victoria Road/Lyons Road
  - Victoria Road/Darling Street
  - Victoria Road/Robert Street
- Concern that if the access to Terry Street is not maintained then access to the Balmain peninsula would be negatively affected
- Concern that the M4-M5 Link will cause heavy trucks to travel state roads, such as Johnston Street, and deteriorate them quickly.

Response

Future conditions without the project – Rozelle interchange and surrounds

Section 8.3 of Appendix H (Technical working paper: Traffic and transport) of the EIS establishes that without the project, with forecast traffic growth, the network performance in the vicinity of Rozelle including on roads such as Lilyfield Road, Anzac Bridge, Victoria Road, City West Link, Ross Street, Gladesville Bridge, Johnston Street, Catherine Street, Victoria Road at Drummoyne, The Crescent, Johnston Street and James Craig Road, is forecast to deteriorate over time. Longer queues are forecast on the Western Distributor and flow breakdown on Anzac Bridge, Victoria Road and City West Link in the AM peak period. In the PM peak period, the network performance is also forecast to deteriorate over time, with the network unable to accommodate the future traffic demands.

Intersection performance analysis demonstrates that by 2033, without the project, more intersections along Victoria Road are forecast to experience significant congestion during the peak hours than they currently do.

Future conditions with the project – Rozelle interchange and surrounds

By 2023, comparing the 'With project' scenario to the 'Do minimum' or 'Without project' scenario:

- There is a substantial increase in overall forecast traffic demand in this area during the AM peak hour due to the new connectivity being provided by the Rozelle interchange, with eastbound congestion issues on the Western Distributor, mainly due to downstream exit blocking from Sydney Harbour Bridge. Congestion on the Western Distributor and across Anzac Bridge in the eastbound direction is forecast to cause queuing and delays on City West Link and Victoria Road and, for brief periods, the M4 East eastbound exit ramp and the Iron Cove Link ramp to Anzac Bridge. Approaches to address this are discussed in the mitigation section (refer to Chapter 11 of Appendix H (Technical working paper: Traffic and transport) of the EIS)
- In the PM peak hour, there are travel time improvements in the peak westbound direction towards City West Link and Victoria Road due to the Iron Cove Link and M4 connectivity. There are also forecast eastbound delays on the same roads caused by forecast traffic demand increases to Sydney Harbour Bridge.

By 2033, comparing the 'With project' scenario to the 'Do minimum' or 'Without project' scenario:

- In the AM peak period, Anzac Bridge/Western Distributor is more congested citybound because of a forecast increase in demand due to the new connectivity being provided by the Rozelle interchange. As in 2023, citybound movements are mainly affected by the downstream exit blocking from Sydney Harbour Bridge. Congestion on the Western Distributor and across Anzac Bridge is forecast to cause delays and queues on City West Link and Victoria Road, as well as the M4 East exit ramp and the Iron Cove Link ramp to Anzac Bridge. Approaches to address this are discussed in the mitigation section
- In the PM peak period, the modelled road network with the project performs better than the 'Without project' scenario, especially westbound from the Sydney CBD, due to the introduction of free flow connections from Anzac Bridge to the M4 East and Iron Cove. There is large unreleased demand on Western Distributor (as in the base case), The Crescent and Johnston Street by the end of the peak hour, indicating vehicles are likely to struggle to enter the modelled network in the peak hour.

In both 2023 and 2033, comparing the 'Cumulative' scenario to the 'With project' scenario:

- Anzac Bridge/Western Distributor is forecast to be less congested eastbound in the AM peak period due to traffic reassigning to the proposed future Western Harbour Tunnel (and Beaches Link in the 2033 'Cumulative' scenario)
- In the PM peak period, the network functions similar to the project case, with fewer unreleased vehicles on Western Distributor due to traffic reassigning to Western Harbour Tunnel (and Beaches Link in the 2033 'Cumulative' scenario)
- Primarily due to capacity constraints on Anzac Bridge and the Western Distributor, forecast demands cannot access the road network during the peak periods due to congestion extending back into model entry points. This occurs at the model boundaries on Victoria Road, City West Link and The Crescent/Johnston Street. Potential mitigation measures are discussed in **Chapter E1** (Environmental management measures) and below. In such instances peak spreading may occur as commuters plan trips either side of peak times.

A review of operational network performance will be undertaken 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections in proximity to the Wattle Street interchange, Rozelle interchange and St Peters interchange. The assessment will be based on updated traffic surveys at the time and the methodology used will be comparable with that used in the EIS assessment. The results of the review will be considered in future operational network performance planning carried out by Roads and Maritime (see environmental management measure OpTT1 in **Chapter E1** (Environmental management measures) for further information).

Roads and Maritime will develop a strategy to ensure appropriate network integration in the areas surrounding the Rozelle interchange (see environmental management measure OpTT3 in **Chapter E1** (Environmental management measures)). The strategy will include a review of:

- Capacity improvement measures
- The interface with road based public transport on the Western Distributor and Victoria Road in consultation with Transport for NSW
- Project staging options
- Demand management measures.

Traffic signals

Free flow connections to Victoria Road and Anzac Bridge are proposed as part of the project. The construction or modification of intersections with traffic lights (traffic signals) for the project is required where free flow connections are not optimal due to design or connectivity constraints. The intersections would be designed to safely and efficiently manage traffic entering and leaving the surface road network and the Rozelle interchange tunnels at these locations.

Intersection performance

Several intersections are noted as remaining the same or experiencing worse LoS under the 'With project' 2033 scenario including Victoria Road/Lyons Road, Victoria Road/Darling Street and Victoria Road/Robert Street. As described in section 10.4.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS for the 2023 and 2033 'With project' scenarios, intersection performance at:

- The Victoria Road/Lyons Road intersection would remain unchanged (LoS F)
- The Victoria Road/Darling Street intersection would remain unchanged in the AM peak and improve in the PM peak (LoS F to LoS C)
- The Victoria Road/Robert Street intersection would improve in the AM and PM peak in 2023 (LoS D to LoS C respectively) and PM peak in 2033 (LoS F to LoS C) and worsen in the AM peak in 2033 (LoS D to LoS F).

Where intersections would remain at or over capacity, this is primarily due to the forecast demands. However, there are significant reductions in forecast daily traffic volumes along Victoria Road (south of the proposed Iron Cove Link) with traffic shifting to the Iron Cove Link.

Access to Terry Street

No change is proposed to the turning movements permitted at Terry Street. The project would involve the realignment of the signalised right turn lane from the westbound Victoria Road carriageway into Terry Street and tie-in works to connect Terry Street with the eastbound carriageway of Victoria Road.

Changes to heavy vehicle movements

Annexure D of Appendix H (Technical working paper: Traffic and transport) of the EIS includes a heavy vehicle screenline analysis. The screenline analysis forecasts significant reductions in heavy vehicle traffic for the project on roads including Lyons Road, City West Link, Marion Street, Parramatta Road, Norton Street, Booth Street, Stanmore Road, Addison Road, Sydenham Road, Marrickville Road, King Street, Botany Road, Southern Cross Drive and King Georges Road.

The screenline analysis forecasts an increase in heavy vehicle traffic on Johnston Street and a slight increase on Ross Street. Johnston Street is a state road with sufficient width to accommodate additional heavy vehicle traffic.

C8.17 Operational impact on network performance – St Peters interchange and surrounds

1160 submitters have raised issues regarding the impact of the St Peters interchange on operational traffic network performance. Refer to section 8.3 of the EIS for details of potential operational traffic and transport impacts.

C8.17.1 Impact on network performance

Submitters raised concern that the network performance in the surrounds of the St Peters interchange would be impacted, including concerns associated with the forecast increase in traffic in the area as a result of the project. Specific concerns include:

- Network performance on King Street, Gardeners Road and Euston Road will not improve with the completion of the project
- A solution to traffic issues in the area surrounding Euston Road and Canal Road have not been provided, despite the upgrades proposed
- Many intersections/roads will worsen or remain unchanged as a result of the St Peters interchange. These include:
  - The Princes Highway/Canal Road
  - The Princes Highway/Railway Road
  - Unwins Bridge Road/Campbell Street
  - Campbell Road/Bourke Road
  - Ricketty Street/Kent Road
  - Gardeners Road/Kent Road
  - Gardeners Road/Bourke Road
  - Gardeners Road/O'Riordan Street
  - Edgware Road
  - Bourke Street
  - Gardeners Road
- The project will lead to increased congestion on local roads at Alexandria, Newtown, Enmore and Erskineville
- The St Peters interchange will have severe negative impacts on roads in Alexandria, Green Square, Rosebery, Kensington, Erskineville and Newtown.

Response

Future conditions without the project - St Peters interchange and surrounds

The assessment of individual intersections within a dense urban network surrounding a large interchange does not present a complete picture of overall network performance. The EIS therefore presents network statistics that show overall performance of the network and LoS of individual intersections.

As with the other interchanges, forecast traffic growth without the project is expected to negatively impact the network performance around the St Peters interchange and surrounds. The introduction of the St Peters interchange with the opening of the New M5 project (but without the M4-M5 Link) project, along with increased demand to and from Sydney Airport, is forecast to increase traffic demand in an already congested area, and cause a drop in average speeds in the network during peak hours.

The main areas of congestion are forecast to be in Mascot, in particular Gardeners Road, O'Riordan Street, Botany Road and the Princes Highway corridors. Intersections along these corridors are forecast to be unable to cope with increased demand and many are forecast to experience significant congestion during the peak hours. Poor overall intersection performance is likely to contribute not only to local congestion, but, in extreme cases, may cause queuing on the St Peters interchange exit ramps back to the mainline of the New M5 Motorway.

Future conditions with the project - St Peters interchange and surrounds

In 2023, comparing the 'With project' scenario to the 'Do minimum' or 'Without project' scenario:

- With the intersection upgrades, the 'With project' scenario performance is forecast to be similar to the 'Without project' scenario. While average AM peak hour network traffic speeds and travel times are comparable, average network speeds in the PM peak hour are 28 per cent slower.

In 2033, comparing the 'With project' scenario to the 'Do minimum' or 'Without project' scenario:

- In the AM peak hour, with the intersection upgrades, the 'With project' scenario is forecast to provide improved network operation when compared with the 'Without project' case. In the PM peak hour, the 'With project' scenario performs worse, with lower average network speed and longer travel times. Intersections are forecast to operate at similar or worse LoS
- Consistent with what was reported in the New M5 EIS, these results indicate that the complete WestConnex program of works, and the completion of the Sydney Gateway, is required to ensure the St Peters interchange area operates satisfactorily.

In 2023, comparing the 'Cumulative' scenario to the 'With project' scenario:

- The 'Cumulative' scenario has higher forecast traffic demands than the 'With project' scenario. Sydney Gateway provides a bypass to Mascot town centre, which contributes to improved network performance. Even with the forecast increased traffic demands, higher average network speeds are forecast in both peaks
- Average network speed improves as a result of Sydney Gateway. However, buses only use the surface road network, which is still congested in both scenarios. As a result, despite higher average speed in the overall network, buses spend a similar amount of time travelling in the network.

In 2033, comparing the 'Cumulative' scenario to the 'With project' scenario:

- Similar to the 2023 network performance results, the 'Cumulative' scenario has a higher forecast demand than the 'With project' scenario, but both peaks are forecast to perform better than the 'With project' scenario. In both peaks, higher average network speeds are predicted in the 'Cumulative' scenario network in spite of higher demands in the network. Similar to the 2023 scenarios, buses spend a comparable amount of time travelling in the network in the 2033 'Cumulative' scenario.

The surface road network in the model is unable to accommodate the forecast peak hour demands without the additional road capacity provided by the proposed future Sydney Gateway. The proposed future Sydney Gateway introduces a bypass to Mascot town centre and, in its absence, it would be necessary to introduce upgrades at a number of intersections.

Management of impacts

The analysis has indicated a deteriorated network performance in the St Peters and Mascot area with the project. However, once Sydney Gateway is in place, a considerable amount of traffic would be removed from the St Peters and Mascot area and the network performance improved to a level generally better than in the 'Without project' scenarios. Sydney Gateway is expected to be open at a similar time to the M4-M5 Link and separate planning, environmental assessment and approvals processes are underway. Specific interim mitigation measures for the 'With project' scenario are therefore not proposed.

Should the Sydney Gateway project be delayed for a significant length of time, it is expected that both the New M5 Road Network Performance Review Plan (conditioned as part of the New M5 approval) and the proposed M4-M5 Link Road Network Performance Review would confirm the operational traffic impacts of the projects on surrounding arterial roads and major intersections. These reviews are scheduled at 12 months and five years after the commencement of operation of the New M5 and the M4-M5 Link respectively. Key intersections in the St Peters and Mascot areas are already identified for review in the New M5 Road Network Performance Review Plan as part of the New M5 conditions of approval and the following additional intersections should be included in the M4-M5 Link Road Network Performance Review Plan:

- Gardeners Road/Kent Road
- Gardeners Road/O'Riordan Street
- Kent Road/Coward Street
- Bourke Road/Coward Street
- Kent Road/Ricketty Street.

These reviews would examine potential management measures at these locations, and other locations as identified in the Road Network Performance Review, to improve performance following the collection of data that would facilitate a clearer understanding of actual project impacts.

Submitters identified that some intersections modelled near the St Peters interchange would not see improvements or would see performance remain unchanged, particularly under the 'With project' 2033 scenario. Section 10.5.3 of the Technical working paper: Traffic and transport in Appendix H of the EIS details the forecast results of the intersection performance modelling undertaken for the intersections listed by the submission. The modelling results show that:

- In the AM peak hour, under the 2023 'With project' scenario, the intersections generally record similar LoS compared with the 'Without project' scenario, except for the Campbell Road/Bourke Road and Gardeners Road/Bourke Road intersections
- While by 2033, all of the intersections perform similar or better in the 'With project' scenario, with the exception of the Campbell Road/Bourke Road intersection
- In the 2023 PM peak hour, the intersections generally forecast similar LoS compared with the 'Without project' scenario, except for the Campbell Road/Euston Road, Princes Highway/Campbell Street and Gardeners Road/Bourke Road intersections
- In the 2033 PM peak hour, most intersections are forecast to operate poorly, which corresponds to the poor network performance due to background traffic growth
- If the 'With project' 2033 scenarios are similar to the 'Without project' 2023 scenarios it suggests the project is assisting to meet demand due to background growth that occurs in the interim.

The lower north-south screenline analysis included an assessment of the impacts to King Street against all modelled scenarios. Section 9.5 of Appendix H (Technical working paper: Traffic and transport) shows the result of the screenline for King Street a two-way reduction of 19 per cent in 2023 and 2033 in project only scenarios when comparing all 'With project' scenarios' to the 'Without project' scenarios.

C8.17.2 Support of the project

Submitter believes that project will improve congestion on King Street as the Eastern Distributor did to Crown Street.

Response

The support for the role of the project in improving congestion on King Street is noted.

C8.18 Operational impact on parallel routes

1324 submitters have raised issues regarding impacts resulting from the project on parallel routes. Refer to section 8.3.3 of the EIS for details of potential operational traffic and transport impacts.

C8.18.1 Impact on parallel routes due to drivers seeking to avoid tolls or congestion

Submitters have expressed concern that drivers seeking to avoid the toll would use routes parallel to the project, exacerbating traffic congestion issues along these roads. Submitters raised the following specific issues and roads:

- Roads around Haberfield and Ashfield, including:
  - Parramatta Road
  - Frederick Street
- Roads around Rozelle, Leichhardt and Annandale, including:
  - Victoria Road
  - Callan Street
  - City West Link
  - Catherine Street
  - Ross Street
  - Booth Street
  - Johnston Street
  - The Crescent
- Roads around St Peters and Alexandria, including:
  - King Street
  - Edgeware Road
  - Enmore Road
  - The Princes Highway
- Additional information requested for parallel route impacts as a result of tolling the Iron Cove Link.

Response

The WRTM toll choice assignment model was developed to test impacts of toll and infrastructure strategies and provide infrastructure project traffic forecasts. The model is designed to forecast the traffic choosing to use tolled and non-tolled routes for the representative peak and inter-peak periods of the day. The development of the model included VTTS survey analysis to investigate people's willingness to pay tolls to use toll roads based on project specific market research surveys. The toll choice assignment model informed all aspects of traffic modelling for the project, including the screenline analysis.

A screenline analysis has been carried out to examine how traffic patterns including for heavy vehicles along and adjacent to the arterial road network may change as a result of the operation of the project (in 2023 and 2033). Chapter 9 of Appendix H (Technical working paper: Traffic and transport) of the EIS shows the result of the screenline analysis. Analysis of the operation of the full WestConnex program of works as well as the proposed future Western Harbour Tunnel and Beaches Link program of works and F6 Extension and Sydney Gateway project was also undertaken. Screenline analysis provides an indication of motorists' likelihood to use parallel routes, to avoid congestion or tolls, as it looks at alternatives to strategic routes that generally require arterial or motorway road connections at some point during the trip.

Four screenlines, which represent theoretical boundaries specifically designed to collectively analyse directional and two-way traffic volume outputs from the different modelling scenarios have been established (refer to Figure 9-1 of Appendix H (Technical working paper: Traffic and transport) of the EIS):

- The east–west screenline captures changes in east–west traffic movement and includes a location on the M4-M5 Link mainline tunnels between the Wattle Street and Rozelle interchanges, as well as on four parallel corridors (City West Link, Darley Road, Marion Street and Parramatta Road). This screenline also includes a location on Lyons Road, which would reflect any changes in traffic using Lyons Road to travel to and from Victoria Road
- The upper north–south screenline captures changes in vehicle travel patterns on north–south links north of Parramatta Road, including Norton Street, Balmain Road, Catherine Street, Johnston Street, Booth Street (north of Pyrmont Bridge Road) and Ross Street (north of Bridge Road). These roads are close to the Rozelle interchange and would display changes in traffic on surface roads as a result of the new road connections at the Rozelle interchange
- The lower north–south screenline includes a location on the M4-M5 Link mainline tunnels between the Rozelle interchange and the St Peters interchange, as well as locations on 10 north–south regional connector roads (Stanmore Road, Addison Road, Sydenham Road, Marrickville Road, King Street, Wyndham Street, Botany Road, Elizabeth Street, South Dowling Street and Southern Cross Drive)
- The cross-harbour screenline looks at changes in cross-harbour traffic flow on the Sydney Harbour Bridge, Sydney Harbour Tunnel and the Gladesville Bridge. It also includes a location on the proposed future Western Harbour Tunnel in the 2023 and including the Beaches Link in the 2033 'Cumulative' scenarios.

The screenline analysis found that as a result of the new roadway links provided by the project, the two-way future year AWT traffic demand compared to a 'Without project' scenario is predicted to significantly decrease on:

- City West Link and Parramatta Road, east of the M4 East Wattle Street and Parramatta Road ramps respectively, by about 25 per cent in 2023 and 2033 'With project' and 'Cumulative' scenarios
- King Street in St Peters by about 20 per cent in the 2023 and 2033 'With project' scenarios. Other roads listed by submissions, but not specifically assessed as part of this screenline, are expected to also have some benefits, such as roads through Enmore
- Stanmore Road in Stanmore by about 15 per cent in 2023 and 2033 'With project' and 'Cumulative' scenarios
- Lyons Road in Russell Lea by about 15 per cent in the 2023 and 2033 'With project' scenarios, and about 20 per cent in the 2023 and 2033 'Cumulative' scenarios
- Southern Cross Drive and the Sydney Harbour Tunnel by about 20 per cent and 25 per cent respectively in the 2023 and 2033 'Cumulative' scenarios.

In the 2033 'Cumulative' scenario, increases are forecast in daily two-way volumes on Johnston Street, north of Parramatta Road in Annandale (about five to 15 per cent in the 'With project' scenario and about 10 to 20 per cent in the 'Cumulative' scenario) and on Gladesville Bridge (about five per cent in the 'With project' scenario and 10 to 20 per cent in the 'Cumulative' scenario). These increases reflect the forecast demand to and from the Rozelle area due to the new connectivity being provided by the Rozelle interchange.

Annexure D of Appendix H (Technical working paper: Traffic and transport) of the EIS includes a heavy vehicle screenline analysis. The screenline analysis forecast significant reductions in heavy vehicle traffic for the project on roads including Lyons Road, City West Link, Marion Street, Parramatta Road, Norton Street, Booth Street, Stanmore Road, Addison Road, Sydenham Road, Marrickville Road, King Street, Botany Road, Southern Cross Drive and King Georges Road.

The screenline analysis forecast an increase of heavy vehicle traffic on Johnston Street and a slight increase on Ross Street. Johnston Street is a state road with sufficient width to accommodate additional heavy vehicle traffic. Modelling of the Johnston Street intersection with The Crescent is likely to remain relatively stable across the 'With project' scenarios with the 2033 AM peak seeing a slight improvement and the 2033 PM seeing a slight deterioration. Forecast traffic growth is due to the new connectivity being provided by the Rozelle interchange.

The reduction in traffic demand on these major traffic routes is likely to improve speed, journey reliability and safety on these corridors compared to a 'Without project' scenario. This indicated that due to improved performance of the road network with the project, there is unlikely to be significant parallel route use due to congestion avoidance.

As a result of the new roadway links provided by the project, the two-way future year traffic demand compared to a 'Without project' scenario is predicted to result in:

- A minor increase in average weekday traffic volumes (around four per cent) on Johnston Street and Ross Street in 2023 and 2033 as traffic moves between the surface road network and the M4-M5 Link. This increase rises on Johnston Street (around 15 per cent in 2023 and around 12 per cent in 2033), and Ross Street (around 16 per cent in 2023 and about 20 per cent in 2033) in the cumulative scenario
- Slight forecast increases (about two per cent) traffic volumes on Wyndham Street, Botany Road, Elizabeth Street and King Street in the 'Cumulative' scenario
- In 2023 and 2033 traffic is forecast to increase by between six to 13 per cent on the Gladesville Bridge. This reflects the increase in traffic along Victoria Road due to vehicles using the Iron Cove Link and the M4-M5 Link mainline tunnels, via the Rozelle interchange.

Heavy vehicle analysis predicts:

- Forecast increases on Johnston Street and Ross Street as heavy vehicles move between the surface road network and the M4-M5 Link tunnels. However, in the peak hours, these increases are generally less than around 80 heavy vehicle movements per hour, and in some cases are directional, with an increase in one peak hour forecast to be a decrease in the other peak hour.

In regards to impacts on congestion in streets at Annandale, Leichhardt, Rozelle and Haberfield see **section C8.15** to **section C8.17** which discusses network performance in the vicinity of each of the interchange areas including the streets of the listed suburbs.

The project is not proposing to toll the Iron Cove Link. The M4-M5 Link is a new piece of tolled infrastructure. It would therefore not generate toll avoidance in the same way as, for example, the M4 Widening project which reinstated the toll back onto the existing M4 Motorway or the New M5 project that introduced a toll on the existing M5 East Motorway. Generally, the traffic using the M4-M5 Link in the future would have been travelling on other roads. However, more traffic would use the project if it was untolled, so a form of toll avoidance would occur. When considering the potential for drivers to seek alternative routes or avoid tolls, it should also be noted that human behaviour is often a determining factor and while traffic controls are put in place to minimise this occurring, drivers have free will to choose their own path of travel.

The project does not introduce tolls on existing untolled roads. Existing routes used by motorists will continue to be available. The road networks surrounding the project interchanges will be subject to changing traffic patterns in the 'With project' scenarios and therefore the EIS carefully assesses these impacts and shows where performance changes and what these impacts are.

Once the M4-M5 Link is operational, it is expected that there would be a period where drivers trial using their existing, toll-free routes or the new, tolled M4-M5 Link, before deciding on a regular route. Congestion in peak periods on existing, toll-free surface roads would provide an incentive to use the new, tolled motorway.

Callan Street is a narrow local residential street and would not realistically be used as an alternative route to the project.

The proposed M4-M5 Link Road Network Performance Review Plan will require an operational traffic performance review 12 months and five years after the M4-M5 Link is open to traffic. This review will examine potential management measures following the collection of updated data that will facilitate an understanding of actual project outcomes including the potential redistribution of traffic onto alternative routes and the resulting impact on these routes. Roads and Maritime will, as part of the ongoing consultation with relevant councils, develop post-opening mitigation measures, if required.

Section 8.3.3 and Chapter 9 of Appendix H (Technical working paper: Traffic and transport) of the EIS provide further detail regarding the potential impacts of the project on traffic using alternate parallel routes.

C8.18.2 Submissions in favour of the project

Submitter believes that project will reduce rat-running traffic through Stanmore.

Response

Support for the reduction of rat-running through Stanmore is noted. As described in **section C8.18.1**, the screenline analysis found that as a result of the new roadway links provided by the project, the two-way future year AWT traffic demand compared to a 'Without project' scenario is predicted to significantly decrease on a number of parallel routes. This would be expected to be associated with the decreased use of local roads in proximity to the parallel routes.

C8.19 Operational impacts on local roads

78 submitters have raised issues regarding impacts resulting from the project on local roads. Refer to section 8.3 of the EIS for details of potential operational traffic and transport impacts.

C8.19.1 Impacts on local roads

Submitters are concerned that impacts such as congestion, rat-running and road closures would impact local roads.

Specific concerns include:

- Impacts to local roads around the Wattle Street interchange, Rozelle interchange and St Peters interchange
- The closure of Clubb Street will increase traffic on Toelle Street which is not wide enough to support two-way traffic.

Response

Impacts to local roads (that are not considered as part of the screenline analysis or the areas covered by operational models as described in in Chapter 9, Chapter 10 and Chapter 11 of Appendix H (Technical working paper: Traffic and transport) of the EIS are not specifically assessed in the EIS. With increasing population resulting in increased road trips, some drivers seek to avoid congestion by rat-running. Without either a reduction in demand or increased capacity, this is likely to increase. The project provides additional road network capacity and improves journey times as traffic shifts to the motorway.

As described in **section C8.18.1**, the screenline analysis found that as a result of the new roadway links provided by the project, the two-way future year AWT traffic demand compared to a 'Without project' scenario is predicted to significantly decrease on a number of parallel routes. This would be expected to be associated with the decreased use of local roads in proximity to the parallel routes.

In addition, certain intersections of local streets and arterial roads connected to interchanges are being upgraded as part of the project to ensure safe and efficient connections and provide the necessary additional capacity to cater for future traffic growth. The performance of these roads are described in Chapter 10 and 11 of Appendix H (Technical working paper: Traffic and transport) of the EIS. Impacts to local roads around the Wattle Street interchange, Rozelle interchange and St Peters interchange are also discussed in **section C8.15** to **section C8.17** .

Impact to local roads near Callan Street

When the project is operational, Clubb Street would be disconnected from Victoria Road. The access to King George Park would be maintained via Manning Street, Toelle Street and Callan Street. Traffic surveys indicate that Toelle Street currently functions as the main access to King George Park and so this would not change. Clubb Street only has a small number of houses and as a result the traffic redirected to other surrounding streets would not be significant. Traffic speeds are already reduced in local roads to manage their narrow carriageway width.

C8.20 Operational impacts on pedestrians and cyclists

879 submitters raised concern relating to impacts on pedestrians and cyclists during operation. Refer to Chapter 13.5 and Appendix N (Technical working paper: Active transport strategy) of the EIS for details regarding active transport measures for the project.

C8.20.1 Pedestrian and cyclist safety and requests for additional measures

Submitters raised general concerns regarding the impact of the project on pedestrian safety. Specific concerns included:

- Concerns for pedestrian safety at Springside Street and Quirk Street and at Callan Street specifically as a result of realignment of Victoria Road
- Concern about traffic management and safety of children around schools including the Rozelle Public School
- Proposal that an underpass or overpass at Terry Street across Victoria Road is provided to increase the safety and movement for pedestrians and bikes across Rozelle
- Request for details of the impacts on bus routes, bus stops, cycle paths and footpaths within 500 metres of the project footprint during operation
- Concern that the removal of the Victoria Road foot bridges will encourage pedestrians trying to access bus stops on Victoria Road near Lilyfield Road to cross Victoria Road
- Concern for negative impacts on cycle paths on Victoria Road
- Request for additional footbridges/underpasses across Victoria Road to Darling Street and to Terry Street to improve safety of the local community
- Concern that the project will negatively affect the safety of cycle and foot traffic in the surrounding areas of St Peters, Haberfield and Rozelle Interchanges
- Request that a 40 kilometres per hour school zone be implemented along Campbell Road or a pedestrian footbridge provided over Campbell Road to the school
- Suggestion that improved links across Wattle Street/City West Link between Haberfield and Five Dock be created as well as extra pedestrian/cyclist crossings across Parramatta Road
- Concern that shared paths will not be provided where roads are widened
- Submitter objects to the proposed replacement of the bridge over Victoria Road with an underpass. They believe there are safety concerns for users as the underpass is not visible to the public
- Request for a strategy to ensure that pedestrians can safely and easily walk in the area.

Response

The project provides an opportunity to address poor active transport connectivity in the study area, including along Victoria Road at Iron Cove and within and through the Rozelle Rail Yards at Rozelle through the provision two new active transport bridges over City West Link and an underpass beneath Victoria Road connecting to Lilyfield Road in the west and Anzac Bridge and The Bays Precinct in the east. New active transport for the project would provide connectivity with existing active transport routes. Refer to section 13.5.3 and section 13.5.4 of the EIS and Appendix N (Technical working paper: Active transport strategy) of the EIS for further information regarding active transport to be provided for the project. Cyclist and pedestrian paths delivered by the project would create safe links that have reasonable grades and are separated from vehicular traffic.

Two key pedestrian bridges would be replaced at Victoria Road and City West Link, improving active transport access at Rozelle. Connectivity across Victoria Road would be maintained through the provision of a pedestrian underpass beneath Victoria Road and connectivity across City West Link would be provided by the two new active transport bridges into the Rozelle Rail Yards. The provision of these connections would provide safe alternatives to the existing pedestrian bridges that would be removed for the project.

Although realignment of Victoria Road would require the tie-in with Callan Street and Springside Street at Rozelle to be constructed, other changes to the operation of the streets would be negligible. Due to the narrow nature of the streets in this area and the slow posted speed limit, vehicles are not expected to traverse Callan Street and Springside Street in a manner that would raise pedestrian safety issues beyond the current situation.

A new pedestrian footpath and separated cycleway would be provided between Springside Street connecting to the Bay Run at Byrnes Street on the southern side of Victoria Road. It is anticipated that sufficient space would be provided for a two-way cycleway as well as a separate footpath that meets required standards.

The project is unlikely to have an impact on pedestrian safety on these local roads. See **section C8.19.1** for further information regarding the impact of the project on local roads. It is unlikely that as a result of the project Quirk Street would become an alternative route for traffic trying to avoid arterial roads.

The signalised pedestrian crossing on Victoria Road between Terry Street and Toelle Street would be retained as part of the permanent design. This would ensure that a safe path across Victoria Road is maintained for pedestrians at this location. Pedestrian and cycle traffic seeking to cross Victoria Road further to the north will be able to use the shared path which runs under Iron Cove Bridge. This path would eliminate any pedestrian interaction with vehicular traffic and therefore reduce the associated risks.

The Rozelle Public School is currently accessed via local roads including pedestrian access from Darling Street and vehicular access from Wellington Street, both of which connect to Victoria Road. As part of the project no changes are proposed to the existing signalised pedestrian crossing of Victoria Road at Darling Street and of Victoria Road at Wellington Street. No changes are proposed to any pick-up or drop-off areas which currently service the school. Similarly, the project will not require students to access busy roads and there would be no change to the number and location of bus stops along this section of Victoria Road. With no change to traffic management for the Rozelle Public School there is not expected to be a change in the safety of students as a result of the project. As described above, the project would reduce traffic along this section of Victoria Road.

Changes to bus routes due to the amended road network would be subject to implementation by the bus service operator.

The request for a 40 kilometre per hour zone or pedestrian bridge on Campbell Road near the school is noted, but is outside the scope of the project and is a matter for Roads and Maritime to consider separately when reviewing school zones and speed limits on existing roads. The New M5 project is upgrading and widening Campbell Road. Following the completion of the New M5 project, school children would be able to cross Campbell Road at the following signalised intersections in the vicinity of St Peters Public School:

- Unwin's Bridge Road
- St Peters Street
- The Princes Highway
- Albert Street
- New Campbell Road pedestrian and cycle bridge (linking to Sydney Park).

The project would contribute 3.8 kilometres to the existing active transport network in the study area. Chapter 13 (Urban design and visual amenity) and Appendix N (Technical working paper: Active transport strategy) of the EIS identifies new and active transport links within the project footprint that would be provided by the project and other active transport links outside the project footprint that would be delivered separate to the project by others.

Suggestions for other active transport infrastructure to be constructed, for example an additional pedestrian bridge over the City West Link at Five Dock and along Parramatta Road, are noted. The project is not proposing surface works in these areas and traffic volumes on City West Link and Parramatta Road are predicted to decrease as a result of the project.

C8.20.2 Impacts on pedestrian and cyclist connectivity

Submitters have raised concerns that the project would impede pedestrian connectivity and access and that the project does not incorporate adequate new pedestrian and cyclist infrastructure in the project design.

Specific concerns include:

- The project does not adequately cater to the needs of cyclists
- Concern with the Darley Road motorway operations complex impeding pedestrians ability to access the Leichhardt North light rail stop
- Concern regarding the removal of the pedestrian crossing in front of the Darley Road site and that this would impact disabled access to the light rail stop
- Request for details of the access impacts to King George Park and the Bay Run
- Concerned about the impact that removing pedestrian and cycle bridge over City West Link will have or if it will be replaced
- Concern that the project will impact the connectivity between Balmain and Rozelle for pedestrians
- Concern about the removal of the pedestrian access to Anzac Bridge.

Response

Concerns regarding impacts to pedestrian and cyclist connectivity are addressed in **section C13.10.1**.

C8.20.3 Submissions in support

Submitters provided support that the project would improve active transport opportunities.

Response

The support for the project and the improved active transport opportunities it will provide is noted.

C8.21 Traffic safety (vehicles) during operation

410 submitters have raised issues regarding traffic safety of vehicles during operation of the project. Refer to section 8.3 of the EIS for details of potential operational traffic and transport impacts.

C8.21.1 Traffic safety

Submitters have raised general concerns that the project would result in an increase in the number of vehicle incidents in the tunnel and on surface roads.

Specific concerns raised include:

- The EIS states that there will be an increase of traffic, which inevitably leads to more road accidents. Specific concerns for safety in the vicinity of St Peters interchange
- The safety of people travelling in the tunnel for such a long distance without any means of exiting
- The project should not increase the number of lanes by reducing the width of lanes for the Inner West subsurface interchange
- Vehicles will travel faster on Victoria Road and this will lead to additional safety incidents.

Submitters also raised concerns about the safety of vehicles entering and exiting Callan Street in Rozelle due to the relocated bus stop and alignment proposed on Victoria Road. Specific concerns include:

- The realignment of Victoria Road will greatly affect the speed differential between it (60 kilometres per hour) and Callan Street (10 kilometres per hour) by moving the distance down Callan Street at which vehicles can achieve the posted speed of 10 kilometres per hour. This will create road safety issues

- The new curvature of the road will make it harder for vehicles to turn left to and from Victoria Road into Callan Street, due to the blind corner and speed of vehicles approaching from Victoria Road.

Response

The traffic and transport assessment conducted for the project (summarised in section 8.3.3 of the EIS) includes an assessment of road safety. This assessment compared the predicted the number of traffic incidents and their cost in dollar terms both with and without the project.

Forecast traffic incidents around the Wattle Street interchange comprise:

- Daily traffic on the Parramatta Road is forecast to decrease in the 2023 'With project' scenario, resulting in a decrease in the total number and cost of crashes. Average annual crashes are forecast to decrease from 120 to 96, with the average annual cost of crashes predicted to decrease from $12.9 million to $10.4 million
- In 2033 with the project, forecasts indicate a decrease in daily traffic on Parramatta Road between Wattle Street and City Road, resulting in a decrease in the total number and cost of crashes. Average annual crashes are forecast to decrease from 130 to 104 and the average annual cost of crashes forecast to decrease from $14.1 million to $11.2 million.

Forecast traffic incidents around the Rozelle interchange comprise:

- Daily traffic on Anzac Bridge is forecast to increase in the 2023 'With project' scenario, resulting in an increase in total number and cost of crashes. However, forecast decreases in daily traffic on other roads in the vicinity, especially City West Link and Victoria Road, would result in a decrease in the total number and cost of crashes at these locations compared to the 'Without project' scenario
- A forecast decrease in daily traffic in the 2033 'With project' scenario compared to the 'Without project' scenario on roads such as City West Link and Victoria Road result in a decrease in the total number and cost of crashes at these locations, but daily traffic on Anzac Bridge, The Crescent and Johnston Street is forecast to increase, resulting in an increase in total number and cost of crashes
- Compared to the 2033 'Without project' scenario, there is a small change in the forecast number and cost of annual crashes at these locations (with less than one per cent increase).

Forecast traffic incidents around St Peters interchange, which includes crash reductions resultant from intersection upgrades planned as part of the New M5 project, comprise:

- The traffic crash forecast under the 2023 'With project' scenario on the surface roads in the vicinity of the St Peters area varies. There are increases of less than 10 per cent forecast for the Princes Highway and Euston Road, a decrease of just over 10 per cent forecast for Bourke Road, and a more significant decrease of about 25 per cent forecast for Canal Road/Ricketty Street/Gardeners Road
- In the 2033 'With project' scenario, the forecast increase in traffic on Euston Road would cause an increase in the total number and cost of crashes on Euston Road, south of Sydney Park Road. A forecast increase in traffic on the Princes Highway between Enmore Road and Gannon Street also causes an increase in the number and cost of crashes at this location. However, the significant decrease in daily traffic forecast on the Canal Road/Ricketty Street/Gardeners Road, and Bourke Road between Wyndham Street and Gardeners Road, in combination with the intersection upgrades, would result in a reduction in the total number and cost of crashes on these roads.

The mainline tunnels at the Inner West subsurface interchange would be built to accommodate up to three lanes in each direction. The tunnels have been designed to allow this to occur in the future without any reduction on lane width. When the project opens, this section of the mainline tunnels would be marked for two lanes in each direction, with the capacity to increase to three lanes in each direction subject to future traffic demands. The width of the caverns for the mainline tunnels has been designed to allow for this capacity increase without the need for further excavations. Refer to section 5.3.2 of the EIS which further describes these elements of the project.

In regard to travel speeds more generally, the project would allow the full tunnel length of 7.5 kilometres to be traversed in six minutes based on an average speed of 80 kilometres per hour. To further support safe operations during use of the tunnels, Roads and Maritime will install wayfinding signage to be provided within and on entry/exit to the tunnels. These signs would be installed prior to opening. Investigations are also currently being made into a range of GPS and mobile phone technology options, such as the Waze beacon system, for implementation in the tunnels.

The project would not change the existing posted speed limit on Victoria Road, which is 60 kilometres per hour.

Concern was raised regarding traffic safety as a result of proposed changes to the alignment of Victoria Road including for traffic entering and exiting side streets such as Callan Street. The intersection at Callan Street and Victoria Road will be designed to the latest Roads and Maritime safety and design requirements, Austroads Guides and Australian Standards to minimise potential safety issues. The project would obtain additional land near this intersection to allow greater room for improved turning lanes. This falls within the land that is being acquired along the southern side of Victoria Road, which is required to widen Victoria Road and allow for construction of the portals. Intersections would be designed to provide the appropriate sight line distances for the design speed. It should be noted that the upgraded intersection at this location will remain similar to the current arrangement.

The safety of people travelling in the proposed tunnels was questioned given the proposed length of the tunnels. The tunnels are designed to minimise driver potential for crashing through the use of urban design principals, lighting, carriageway width and other design features to maintain driver alertness and concentration.

An assessment of potential hazards they may be faced by commuters in the tunnels is included in Chapter 25 of the EIS. Measures to be implemented to improve traffic management, including active management, would improve current crash statistics, even in locations which may experience more traffic. In addition, an assessment of hazards and risks, including traffic accidents fires and other potential risks that may occur in the tunnels is provided in Chapter 25: Hazard and risk. In regard to managing the safety of commuters in the event of an incident, adaptive traffic management would be engaged to evacuate the tunnels or prevent additional traffic entering the tunnels following an incident. This is discussed further in **section C5.2.3** and **section C5.7.1**.

A review of operational network performance will be undertaken 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections in proximity to the Wattle Street interchange, Rozelle interchange and St Peters interchange. The assessment will be based on updated traffic surveys at the time and the methodology used will be comparable with that used in this assessment. The results of the review will be considered in future operational network performance planning carried out by Roads and Maritime (see environmental management measure OpTT1 in **Chapter E1** (Environmental management measures)).

C8.22 Operational impacts on parking

116 submitters have raised issues regarding impacts to residential and business parking. Refer to section 8.3 of the EIS for details of potential operational traffic and transport impacts.

C8.22.1 Changes to car parking provision

Submitters have raised concerns that the project would result in the loss of car parking.

Specific concerns relate to parking in the following locations:

- The removal of 20 car spaces used by residents on Darley Road
- Lilyfield Road and near Easton Park and Denison Street, Rozelle
- Concern that the bioretention basin at King George Park will negatively impact resident parking opportunities
- Concern about the loss of parking spaces at Manning Street near King George Park. Toelle Street, Clubb Street and Callan Street at Rozelle
- Concern about the lack/removal of parking on King Street

- Concern about the potential removal of on-street parking on Johnston Street.

Other concerns include traffic from the project potentially creating the need for additional clearways on high streets in the inner west.

Response

The removal of some car parking on Darley Road, near the Darley Road civil and tunnel site (C4), would be limited to the construction period of the project and would be reinstated for the operation of the project. Opportunities to minimise or avoid the need for these car parking spaces during construction would be identified during detailed design and captured in the CTAMP.

No changes are proposed to car parking on King Street as a result of the project. The project would not impact car parking provision at Lilyfield Road, Denison Street or Easton Park. Changes to the future of car parking in this locality, including the provision of new parking spaces associated with the open space at Rozelle, would be subject to further review in the future once open space land uses, and therefore car parking requirements are confirmed. This includes works that would be undertaken by others including UrbanGrowth NSW. The provision of open space and parking would be undertaken in consultation with the Inner West Council and the local community.

Section 5.9.2 of Chapter 5 (Project description) of the EIS describes the location of a bioretention facility for stormwater runoff within the informal car park within King George Park at Rozelle (adjacent to Manning Street). As part of project refinements to remove conflict with an undetermined Aboriginal land claim and to respond to submitters concerns in relation to impacts on the Manning Street car parking area during construction, it is proposed to relocate the bioretention facility from within the informal car park within King George Park to the eastern abutment of Iron Cove Bridge, adjacent to Victoria Road and within King George Park. See **Chapter D3** (Relocation of the bioretention facility at Rozelle) for further information regarding the relocation of the bioretention facility. As a result, the Manning Street car parking area would not be impacted by the relocation of the bioretention facility.

Impact on on-street residential or business parking is not anticipated in the Wattle Street interchange area as part of the M4-M5 Link project. No properties are proposed to be acquired as part of the project. Impact on on-street residential or business parking is not anticipated in the St Peters interchange area as part of the M4-M5 Link project.

As part of the Iron Cove Link surface works, modifications to the intersections between Victoria Road and Clubb Street, Toelle Street and Callan Street are proposed associated with widening of Victoria Road to accommodate the Iron Cove Link tunnel portals. As a result of these road layout changes, there are permanent impacts on on-street parking provision. This is shown in **Table C8-7**. Most of these parking spaces are adjacent to residential and commercial properties being acquired. The final numbers would be confirmed during detailed design. No parking would be lost on Johnston Street or King Street.

Note that no clearways are being proposed as part of this project.

Table C8-7 Indicative permanent impact on on-street parking spaces

Road section	Indicative impact
Byrnes Street, at the northeast end	Loss of 5 spaces
Clubb Street, at the northeast end	Loss of 9 spaces
Toelle Street, at the northeast end	Loss of 7 spaces
Callan Street, at the northeast end	Loss of 2 spaces

C8.22.2 Parking provisions at destination

Submitters have raised concerns that due to the additional traffic on roads, there will not be adequate parking facilities at driver's destinations, especially at the Sydney CBD. Specific concerns include that the project will induce an additional 100,000 cars into the Sydney CBD where there is not adequate parking at present.

Response

The project has been designed to improve the flow of commuter and freight traffic through the road network. Some of the traffic using the project would be redirected from the existing surface road network and some would be traffic associated with population and employment growth, which would need to use other parts of the road network if the project was not built. Parking at destinations in the Sydney CBD is a matter for individual proponents of new developments or the owners or managers of existing developments. It is also noted that organisations such as the City of Sydney have been discouraging the reliance of new development on cars by limiting parking. Further discussion regarding traffic from the project entering the Sydney CBD is provided in **section C8.14**. The assessment of forecast traffic showed that there would be no material change in traffic volumes in the Sydney CBD as a result of the project, as shown in Figure 10-1 and Figure 10-2 in Appendix H (Technical working paper: Traffic and transport) of the EIS.

It should be noted that the project is one part of a broader solution to the emerging pressures of population growth, associated urban expansion and density, as well as increasing freight movements. While public transport is also part of this mix, it is recognised that not all trips in Sydney can be served by public transport, especially trips to dispersed destinations or commercial trips requiring the movement of large or heavy goods/materials. The NSW Government is making significant investment in upgrading Sydney's transport infrastructure to address these emerging pressures including investment in motorway, road and public transport projects.

C8.23 Operational impacts on public transport

940 submitters have raised concerns about the integration of the project with existing public transport. Refer to section 8.3 of the EIS for details of potential operational traffic and transport impacts.

C8.23.1 Operational impacts on public transport

Submitters have raised general concerns that the project would impact on the operation of existing public transport. Specific concerns included:

- The project will contribute to overcrowding on public transport
- Lack of detail on how the project can integrate with the existing public transport network
- Safety of buses
- The project will undermine access to public transport
- Impact on bus routes and stops on Victoria Road
- Impact on travel times and reliability for bus services
- Reduction in the number of bus stops along Parramatta Road
- Buses travelling to the Sydney CBD will be slower, and even though bus times along Parramatta Road are said to improve through the extension of bus lanes, this could be achieved without the WestConnex program of works
- Public transport on Anzac Bridge and Victoria Road will be adversely affected due to there being no dedicated bus lanes on Anzac Bridge
- The St Peters interchange will overwhelm the local bus network, creating more unreliable services
- Impact on bus running times, especially in morning and evening peak hour
- Bus travel times into the city will be increased, and people will have to wait longer at bus stops and walk further to bus stops
- Request for details of operational impacts on bus routes and stops within 500 metres of the project footprint, including but not limited to Victoria Road
- Permanent infrastructure would prevent provision of accessible, safer and direct pedestrian access to the Leichhardt North light rail stop.
- Concern that project will prevent people from being able to use public transport.

Response

There is no evidence that indicates that the operation of the project would result in overcrowding on public transport or that it would undermine public transport use. Furthermore, the NSW Government has committed to an ongoing program of new public transport projects and improvement to existing public transport services to address demand issues. Bus lane infrastructure, location of bus stops and service frequencies would not significantly change as a result of the project. Waiting times at bus stops are therefore unlikely to change. Some minor relocation of bus stops to allow safe operation may occur subject to detailed design of the project. By reducing surface road traffic on sections of Parramatta Road and Victoria Road, the project provides an opportunity to improve public transport services on these key corridors.

Rather than negatively impacting on public transport, the project demonstrates service reliability is maintained or improved in the following areas, as detailed in Chapter 10 of Appendix H (Technical working paper: Traffic and transport):

- Parramatta Road bus travel times during the AM and PM peak hour improve in the 2023 scenario and are maintained in the 2033 scenario
- In the outbound direction, bus journey travel times reduce on the Iron Cove Link and Anzac Bridge in the 'With project' scenario
- Across St Peters for the AM peak hour, the average bus travel time is similar across the scenarios, with a small increase in the 2023 'With project' scenario compared to the 2023 'Without project' scenario, and similar times in the 2033 comparison.

The project may result in an increase in on road public transport travel times in the following areas:

- In the PM peak hour, there is an increase in the average bus travel time on Parramatta Road in the 2023 'With project' compared to the 2023 'Without project' scenario, and again in the 2033 comparison. This reflects the general network comparison and operation in the 2033 PM peak
- The results show longer city bound bus journey times on Victoria Road/Anzac Bridge in the AM peak. This is due to the congested traffic conditions on Western Distributor and Anzac Bridge combined with the increased demands to Bathurst Street and Sydney Harbour Bridge, compared to the 'Without project' case. The operational network integration strategy committed to in the EIS could also include measures to ensure appropriate integration of bus services.

It is considered that an appropriate level of integration with public transport has been provided for the project (refer to section 5.6.8 of the EIS). This includes consideration of pedestrian and cycle paths and maintaining access to light rail stops at Lilyfield North and Rozelle Bay being maintained or improved. Traffic reductions on Parramatta Road and Victoria Road also provide opportunity to improve public transport services on these corridors.

Changes in traffic volumes on roads that are also key bus corridors with the project in both 2023 and 2033 would be expected to impact on the reliability and the trip times of on-road public transport. Reduced traffic volumes on key bus corridors would improve public transport journey times and reliability. In regards to bus stops on Victoria Road, on the southern side of the road, one bus stop is moved (from west of Toelle Street to east of Toelle Street). No changes are proposed to stops on the northern side of the road.

A comparison in average bus travel time across the St Peters modelled road network between the 'Without project' and 'With project' scenarios for the AM and PM peak hours was completed. As there are not one or two dominant bus corridors in the modelled network, an average of all bus travel times has been reported. In the AM peak hour, the average bus travel time is similar across the scenarios, with small increases in the 2023 'With project' scenario compared to the 2023 'Without project' scenario, and similar times in the 2033 comparison. In the PM peak hour, there is an increase in the average bus travel time in the 2023 'With project' scenarios compared to the 2023 'Without project' scenario, and again in the 2033 comparison.

The Leichhardt North light rail stop would continue to have a similar level of access as it currently does once the project is operational. The project aims to maintain or improve connections to public transport services including through improve pedestrian and cycle paths. Operational infrastructure at this location would not impact on access to public transport. Also the project would not occupy all adjoining land to the light rail stop at this location providing opportunity for an additional access to be considered in the future.

A review of operational network performance will be undertaken 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections in proximity to the Wattle Street interchange, Rozelle interchange and St Peters interchange. The assessment will be based on updated traffic surveys at the time and the methodology used will be comparable with that used in this assessment. The results of the review will be considered in future operational network performance planning carried out by Roads and Maritime (see environmental management measure OpTT1 in **Chapter E1** (Environmental management measures)).

Roads and Maritime will develop a strategy to ensure appropriate network integration in the areas surrounding the Rozelle interchange for all road users, including on road public transport (see environmental management measure OpTT3 in **Chapter E1** (Environmental management measures)). The strategy will include a review of:

- Capacity improvement measures
- The interface with road based public transport on the Western Distributor and Victoria Road in consultation with Transport for NSW
- Project staging options
- Demand management measures.

C8.23.2 Opportunities and support

One submitter noted that the project would improve opportunities to access public transport.

Response

The support for the project is noted.

C8.23.3 Integration with future public transportation

Submitters have raised general queries regarding how the project would integrate with future public transport projects, including light rail. Specific concerns included:

- There has not been any thought as to how the project will integrate with future public transport
- The project will remove the option for a rail link to the Balmain peninsula and White Bay precinct
- Loss of future potential public transport corridors.

Response

The project compliments a program of public transport projects aimed at improving transport in and through the Sydney metropolitan area. This includes other projects currently underway such as the Sydney Metro and Sydney CBD and South East Light Rail projects. A range of other public transport projects, including ones which have the potential of interfaces the M4-M5 Link project are also identified in the *Draft Future Transport Strategy 2056* (NSW Government 2017), including:

- Sydney Metro West (subject to final business case)
- Victoria Road public transport improvements
- Parramatta Road public transport improvements
- Extension of Inner West Light Rail line to The Bays Precinct.

A motorway is not by definition designed to integrate with pedestrian commuters for example from light or heavy rail. Rather the project complements public transport by reducing congestion on surface roads utilised by buses.

The project will not remove the Rozelle to Balmain rail corridor. The project partially makes use of some of the corridor that was previously there to service the industry around White Bay. There is urbanisation and gentrification occurring in this area, in particular through the proposed The Bays Precinct project. This includes projects such as the proposed metro linking to The Bays Precinct as identified in the *Draft Future Transport Strategy 2056*.

The government's longer term intention to enhance public transport is also in the *Draft Future Transport Strategy 2056* (NSW Government 2017b) and *Draft Greater Sydney Services and Infrastructure Plan* (Greater Sydney Commission 2017c). In regards to public transport services to Rozelle and surrounds the Plan highlights the already committed Sydney West Metro Project, which is identified as including a station to service The Bays Precinct. This project is anticipated to be delivered over a one to 10 year timeframe. Transport for NSW is consulting with Roads and Maritime around the early design development of the Sydney Metro West to ensure there is appropriate integration between these projects. Additional initiatives include investigation of the extension of the Inner West Light Rail to The Bays Precinct. This is anticipated to occur over a 10 to 20 year timeframe. This demonstrates the government's commitment to delivering public transport to The Bays Precinct, Rozelle and surrounds.

Roads and Maritime and Transport for NSW will continue to work together to deliver ongoing improvements to Sydney's bus network, including *Sydney's Bus Future* in the area around St Peters.

C8.24 Operational traffic environmental management measures

270 submitters have raised issues regarding the mitigation measures to reduce impacts to traffic and transportation during operation of the project. See **Chapter E1** (Environmental management measure) for details of the traffic and transport management measures for the project.

C8.24.1 Operational traffic environmental management measures

Submitters raised concerns regarding the operational traffic environmental management measures. Specific concerns include:

- The EIS contains insufficient detail on operational traffic management for the area around Rozelle Public School
- Concern that resident parking permits will be implemented, leading to parking meters in residential streets
- Request that a traffic management plan be developed to mitigate impacts of residents moving on and off the Balmain peninsula (both for private vehicle and public transport) during peak times
- The nature of post-opening traffic mitigation measures such as road network modifications were not assessed in the EIS
- Request for more information about plans to carry out network integration works in the area around the Rozelle interchange. The EIS mentions the intersection of the Western Distributor and Pyrmont Bridge Road at Pyrmont, Western Distributor near Darling Harbour and a review of kerbside uses near the Western Distributor, The Crescent, Johnston Street and Ross Street
- Request made for a safety audit prior to any management measure options being implemented
- Measures should be implemented to ensure roads don't become rat-runs to avoid tolls
- Suggested measure is to reduce speed limit to 30 kilometres per hour on all local streets
- Heavy vehicles should be forced to use the tunnels and not parallel routes
- Request for the projects operational traffic flows to be consistent with the National Trust Australia policy 'Heritage Impacts of Urban Motorways'
- Roads and Maritime plans to carry out 'network integration' works surrounding the Rozelle interchange once the project is complete but offers little detail of the nature of the works. Queries how the additional traffic congestion in the local roads of St Peters (ie Bourke Street and Gardeners Road will be managed in the absence of a direct connection to the Sydney Airport and Port Botany).

Response

The project will not have direct negative impacts on the traffic in the immediate vicinity of the Rozelle Public School therefore no specific management measures are proposed. A reduction in traffic along Victoria Road (east of Iron Cove Bridge) will, however, have a positive safety impact (see **section C8.20.1** for further information).

Any change to parking permits for residents, or proposals for parking meters, is a matter for the relevant council. No changes to either permits or meters are proposed as part of the project.

Appendix H (Technical working paper: Traffic and transport) of the EIS acknowledges that management of operational traffic and transport impacts around the three interchanges at Wattle Street, Rozelle and St Peters would be required. As with the M4 East and New M5 projects, Roads and Maritime would undertake a Road Network Performance Review, in consultation with Transport for NSW and relevant councils. This would confirm the operational traffic impacts of the M4-M5 Link on surrounding arterial roads and major intersections at both 12 months and five years after opening of the project. The assessment would be based on future updated traffic surveys taken during operation utilising an appropriate methodology following the relevant and industry accepted guidelines current at the time. Regardless, those areas that have been identified as being potentially impacted by the project have been identified in Appendix H (Technical working paper: Traffic and transport) of the EIS and would be addressed prior to these operational reviews, or as needed.

The review would focus on the areas forecast as being potentially impacted by the project including road in the vicinity of each of the three interchanges. In regard to the Balmain peninsula the review would include key connecting roads of the peninsula such as Victoria Road, The Crescent, City West Link and the resulting impacts on Anzac Bridge.

Following the operational road network performance review, specific measures will be investigated and identified to manage the road network performance to mitigate impacts to performance. The implementation of these measures would be subject to separate environmental assessment and approval process.

Measures such as reducing or changing the speed limits on local roads outside the project footprint would be decisions to be made by local government.

In addition, Roads and Maritime will develop a strategy to ensure appropriate network integration in the areas surrounding the Rozelle interchange including the Iron Cove Link to Anzac Bridge/Western Distributor, City West Link and Victoria Road. The strategy will include a review of:

- Capacity improvement measures
- The interface with road based public transport on the Western Distributor and Victoria Road in consultation with Transport for NSW
- Project staging options
- Demand management measures.

Measures that improve performance such as improving travel times and reducing congestion would benefit both private and public transport road users. When examining potential impacts to connections to the Balmain peninsula one of the key access corridors, Victoria Road, would be improved by the project and other roads on the peninsula itself would not be impacted. Accordingly, a worsening of travel times is not anticipated.

Specific measures will be identified as investigations progress and their implementation will depend on their complexity and appropriate timing to minimise impact on the community. Roads and Maritime will carry out these investigations in consultation with SMC, local councils and the DP&E to develop a program of works.

In relation to the St Peters interchange impacts to roads such as Gardener's Road and Bourke Street, the Sydney Gateway is expected to be open at a similar time to the M4-M5 Link. Specific interim mitigation measures for the 'With project' scenario are therefore not proposed.

Should the Sydney Gateway project be delayed for a significant length of time, it is expected that both the New M5 Road Network Performance Review Plan (conditioned as part of the New M5 approval) and the proposed M4-M5 Link Road Network Performance Review would confirm the operational traffic impacts of the projects on surrounding arterial roads and major intersections. These reviews are scheduled at 12 months and five years after the opening of the New M5 and the M4-M5 Link respectively. Key intersections in the St Peters and Mascot areas are already identified for investigation as part of the New M5 conditions of approval and the following should be included in the M4-M5 Link Road Network Performance Review Plan:

- Gardeners Road/Kent Road
- Gardeners Road/O'Riordan Street

- Kent Road/Coward Street
- Bourke Road/Coward Street
- Kent Road/Ricketty Street.

These reviews would examine potential management measures at these locations, and other locations as identified in the Road Network Performance Review, following the collection of data that would facilitate a clearer understanding of actual project impacts. Road Safety Audits are also required by Roads and Maritime for changes to its infrastructure. Refer to section 11.2.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS for further information regarding the operational traffic review and the potential for future management measures (at Wattle Street, Rozelle interchange, St Peters interchange and the respective surrounds) subject to separate environmental assessment and approval. Measures would be consistent with relevant safety criteria and guidelines. The review would also look at potential rat-runs generated and identify possible mechanisms to alleviate these.

Concerns regarding operational impacts to parallel routes and local roads are described in **section C8.18** and **section C8.19** respectively.

The project is not proposing to force heavy vehicles to use the project tunnels. However, reduced journey times that are forecast to occur as a result of the project would reduce the numbers of heavy vehicles on the surface road network.

An assessment of non-Aboriginal heritage impacts of the project is provided in Chapter 20 (Non-Aboriginal heritage) of the EIS, which has not identified the need to limit traffic volumes to protect heritage items in the study area.

C8.25 Cumulative traffic and transport impacts

261 submitters have raised issues regarding cumulative traffic impacts. Refer to section 8.3 and Chapter 26 (Cumulative impacts) of the EIS for details of potential cumulative traffic and transport impacts.

Submitters were concerned about the cumulative traffic and transport impacts. Specific concerns include:

- Concern about the combined effect of traffic that the M4 East and the M4-M5 Link projects will have on the area of Haberfield
- Concern about the combined effect of all the construction movements on City West Link
- Concern about the cumulative impact of traffic on the bus running times around St Peters
- Concern that the Inner City Regional Bicycle Network was not included under projects assessed in the cumulative impact assessment
- Concern that existing development approvals adjacent to the Rozelle Bay foreshore, combined with the M4-M5 Link project, will further increase traffic volumes and will cause major disruptions to traffic flows onto Anzac Bridge and City West Link.

Response

Construction traffic

Cumulative construction traffic impacts are outlined in section 7.6 of Appendix H (Technical working paper: Traffic and transport) of the EIS.

The M4 East and New M5 projects are expected to be operational by 2019 and 2020 respectively; therefore, their construction would not overlap with the M4-M5 Link in the 2021 assessment year. The construction of the M4-M5 Link mainline tunnels is indicatively programmed to start in late 2018, by which stage the M4 East and New M5 tunnel construction will either be complete or almost complete. At Haberfield/Ashfield, there is expected to be very limited overlap in the construction periods for the M4 East and M4-M5 Link (during the period late 2018 and early 2019). During this period, works on M4 East would be ramping down toward completion while works on M4-M5 Link would be ramping up and consist primarily of site establishment. Tunnelling and spoil removal works for the two projects would not overlap and therefore cumulative construction impacts would be limited.

The construction of the proposed future Western Harbour Tunnel project may overlap with the M4-M5 Link project. The Western Harbour Tunnel construction site would add about 66 passenger car units to the road network in the AM and PM peak hours, with construction vehicles travelling through Clusters 1, 2, 3 and 4 (Cluster 2 includes intersections along City West Link).

Analysis indicates that the impact from additional Western Harbour Tunnel construction traffic on the clusters would be minimal, with most intersections operating at the same LoS as without Western Harbour Tunnel traffic. A few intersections within Cluster 1 are forecast to experience a slight worsening in LoS with the cumulative construction impact of the Western Harbour Tunnel construction site. The Parramatta Road/Wattle Street intersection LoS is forecast to worsen from LoS D to LoS E in the AM peak hour for both Option A and Option B. In the PM peak hour, the LoS at the Wattle Street/Ramsay Street intersection is forecast to worsen from LoS E to LoS F in Option A only. Refer to section 7.4 of the Technical working paper: Traffic and transport, which defines these assessed clusters.

Bus travel times around St Peters

Figure 12-14 of the EIS shows the comparison in average bus travel time across the St Peters modelled road network between the 'Cumulative' and 'With project' scenarios for the AM and PM peak hours. In the AM peak hour, the average bus travel time is similar across the scenarios. In the PM peak hour, the average bus travel times increase slightly in 2023 and 2033 in the 'Cumulative' scenarios.

The Inner City Regional Bicycle Network

The Inner City Regional Bicycle Network is identified in Annexure 1 of Appendix N (Technical working paper: Active transport strategy) of the EIS and has been considered as part of the regional active transport connectivity for the M4-M5 Link.

Future development

The population and employment projections used in the WRTM are based on the latest land use data available at the time of forecasting (version LU14v4), produced by DP&E. This data has been projected from the 2011 census data and incorporates known major urban renewal projects and developments, including for the area around Rozelle.

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C9 Air quality

This chapter addresses issues raised in community submissions associated with the air quality assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 9 (Air quality) and Appendix I (Technical working paper: Air quality) of the EIS for the further detail on the air quality assessment.

Contents

C9.1 Level and quality of air quality assessment (general)

633 submitters raised concerns about the methodology or adequacy of the air quality assessment. Refer to sections 9.2, 9.3 and 9.4 and Appendix I (Technical working paper: Air quality) of the EIS for details of the assessment methodology.

C9.1.1 Concern regarding methodology and adequacy of assessment of air quality

Submitters expressed concern about the adequacy and independence of the air quality impact assessment and how it addresses the impacts of emissions resulting from the project. Specific concerns included:

- The air quality modelling should be independently peer reviewed by an academic or public health expert
- Request for an independent air quality assessment to be carried out for the Darley Road civil and tunnel site
- The lifecycle of pollutants generated by vehicles has not been addressed
- Does the air quality modelling account for stop-start conditions
- Ozone pollution was not adequately assessed. A submitter requested further information about the project's impact on ozone pollution
- The cumulative air quality assessment was inadequate as it did not incorporate emissions from White Bay cruise ship terminal and Sydney Airport flight paths
- Rozelle is already subject to air pollution from cruise ships at Balmain
- Air pollution levels already exceed legal limits on Victoria Road
- The air quality data is not presented in a format that is easy to interpret by member of the general public
- Precautionary principle not adequately followed throughout the assessment as required by the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) as alternatives were not provided and assessed
- Cumulative impacts do not include effects of the M4 East and proposed M4-M5 Link
- It is not acceptable that the EIS states that the air quality impacts are acceptable due to their already being an air quality problem
- The EIS does not adequately account for impacts on air quality, considering it identifies an additional five unfiltered outlets to be constructed in inner Sydney
- The EIS should also conduct indoor air quality assessment of nearby residents
- The methodology for air quality assessment has been challenged by experts
- Unhappy that the EIS focused so much on in tunnel air quality and not enough on the other impacts. Unhappy that the EIS states that for some pollutants there is simply no reliable standard or research
- A scenario with public transport has not been considered as a comparison basis for the air quality assessment process
- There are additional receptors at Haberfield Public School who would be effected by air quality impacts
- The EIS downplays the impacts of dust emissions and it is difficult to reliably quantify dust emissions due to variability of the weather
- The air quality assessment was conservative in order to not arouse community concerns
- No assessment was conducted to assess the dispersal of pollution in differing weather conditions.

Response

Technical review

The following NSW Government departments, agencies and bodies were consulted during the development and preparation of the air quality assessment (Appendix I (Technical working paper: Air quality)) of the EIS:

- NSW Department of Planning and Environment (DP&E)
- NSW Environment Protection Authority (NSW EPA)
- NSW Health
- NSW Office of the Chief Scientist and Engineer (Chief Scientist)
- The NSW Government Advisory Committee on Tunnel Air Quality (ACTAQ).

There has been substantial scrutiny and rigour in the review of the air quality assessment completed for the EIS by independent reviewers including international experts engaged by ACTAQ. The EIS, including detailed technical studies, was reviewed by NSW Roads and Maritime Services (Roads and Maritime) subject matter experts, key regulatory agencies and DP&E to confirm that it adequately addressed the Secretary's Environmental Assessment Requirements (SEARs) prior to being placed on public exhibition.

DP&E also commissioned independent technical peer reviews of key technical studies (including air quality) presented in the EIS to inform its assessment of the project. The air quality and ventilation modelling was also reviewed by Sydney Motorway Corporation (SMC's) independent peer reviewers and Roads and Maritime subject matter experts.

The main findings of the ACTAQ review (see **Chapter B3**) of the air quality and ventilation assessment are that:

'Our overall conclusion of the WestConnex [M4-M5 Link] EIS is that it constitutes a thorough review of high quality. It covers all of the major issues and areas that an EIS for a project of this scale should. The information presented is of suitable detail and logical in order. The choices made regarding data used and methods followed have been logical and reasonable and it is our view that the benefit of exploring alternative approaches would be questionable or marginal…..We find that the assessment methodology is sound and represents best practice. All of the models and data used are appropriate and expertly used. We have found no significant omissions, other than lack of inclusion of new information on NOx emissions from late-model diesel light-duty vehicle'.

Assessment approach

The assessment considers the potential air quality impacts during construction and operation of the project. Consideration is also given to the potential cumulative impacts of the project with the other component projects of the WestConnex program of works and related projects in proximity to the project that are likely to be operational within 10 years of the project opening. The assessment includes detailed analysis of the predicted air quality inside the mainline tunnels, including entry and exit ramps, during the operation of the project.

Air quality was assessed for the following pollutants:

- Carbon monoxide (CO)
- Nitrogen dioxide (NO_2)
- Particulate matter less than or equal to 10 micrometres in diameter (PM_{10})
- Particulate matter less than or equal to 2.5 micrometres in diameter ($PM_{2.5}$)
- Air toxics (polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs)).

Section 9.3 of the EIS outlines the assessment of construction dust (see **section C9.3.1** for further discussion related to construction dust). This assessment included meteorological conditions (wind speed, direction and rainfall) and potential adverse impacts which may occur downwind of the site and during drier periods.

The in-tunnel and ambient air quality assessment was undertaken using criteria, or levels of pollutants, that have been adopted by the NSW Government. Computer models calibrated to local conditions have been used to predict:

- In-tunnel air quality
- Changes in ambient air quality arising from the project and other planned infrastructure projects, so that changes in local and regional air quality can be assessed.

The models incorporate the emissions from the future vehicle fleet and the physical characteristics of the motorway, including the tunnel portals and ventilation outlets, and the broader road network.

The air quality impact assessment used a sophisticated meteorological and dispersion model which included local topography and a full year of hourly meteorological data (8,760 hours). Meteorological information including wind direction, wind speed, calms/low wind speed conditions, and temperature inversions, was used to model the peak concentration of air pollutants that may occur. Accumulation of pollutants under low wind speeds was included in the assessment.

Ambient air quality data included existing pollutants from industrial, domestic and transportation sources. The 2015 data used for the background ambient air quality included roadside monitoring stations in addition to background monitoring stations, (refer to Annexure H of Appendix I (Technical working paper: Air quality) of the EIS for details of the stations used). This data therefore accounted for locations where air pollution is already high. Annexure B of Appendix I (Technical working paper: Air quality) of the EIS discusses the pollutant formation, dispersion and transformation processes to provide context for the emissions assessed. A number of pollutants and metrics were not considered to be relevant to the ambient air quality assessment of the project or to road transport projects in general. Section 9.2.6 of the EIS provides the reasoning behind this. For example, ozone is not assessed because of its secondary and regional nature. Ozone cannot practicably be considered in a local air quality assessment. NSW EPA has developed an ozone assessment tool: Tiered Procedure for Estimating Ground Level Ozone Impacts from Stationary Sources (ENVIRON 2011). Although this procedure does not relate specifically to road projects, it was applied to the project to give an indication of the likely significance of the project's effect on ozone concentrations in the broader Sydney region. The results from the tool, shown in section 8.5 of Appendix I (Technical working paper: Air quality) of the EIS, shows that for the 2023 and 2033 'Do something cumulative' (DSC) scenarios, the incremental ozone concentration is below the screening impact level. The scope of the EIS does not extend to consideration of potential future ozone emission standards.

The air quality assessment cannot assess the indoor air quality inside individual residences as every property would be different based on the lifestyle of a household (eg cigarette smoke, cooking and heating methods, and the materials and integrity of the building and its furnishings). The EIS presents the contribution to air pollutants that the project is predicted to make to the ambient or external air quality prior to the individual contribution from lifestyle choices and other sources of pollutants.

The cumulative impact assessment was undertaken in accordance with the SEARs. This assessment considered potential impacts from the construction and operation of the project combined with other component projects of the WestConnex program of works and other related projects. **Section C26.1** describes the process by which there could be cumulative impacts. Emissions from Sydney Airport, associated flight paths and other sources such as the White Bay cruise ship terminal are part of the background air quality which is the baseline used for all of the modelled scenarios including cumulative scenarios.

The design and assessment of the project has benefited from data from the design and operation of existing Sydney tunnels. In particular this has enabled evidence based evaluation of emissions models for both in-tunnel and external emissions modelling.

The precautionary principle has been applied during the design and development of the project (refer to section 27.4.1 of the EIS). Potential environmental impacts associated with the project were considered in the alternatives and options analysis which was summarised in Chapter 4 (Project development and alternatives) of the EIS. This included identifying opportunities to avoid and minimise surface disturbance and construction impacts and to minimise the impacts of vehicle emissions by taking traffic off surface roads and dispersing the emissions at height from the ventilation outlets. This would reduce ground level pollutant concentrations.

The term 'conservative' in environmental analysis means that a worst case assessment or the highest potential impacts identified are reported. The approach adopted is therefore expected to overestimate potential impacts, not underestimate impacts. Therefore, the calculations presented in Appendix I (Technical working paper: Air quality) of the EIS are considered to be a conservative upper limit estimate.

Reporting

The EIS has been prepared by a team of qualified professionals and presents a balanced merit-based environmental impact assessment in accordance with the EP&A Act, the SEARs and applicable NSW assessment policies. This required various detailed investigations and technical specialist studies to be completed to assess the potential environmental impacts of the M4-M5 Link. While the technical working papers and other supporting documents appended to the EIS are by their nature technical documents, the main EIS chapters have been simplified and written in plain English as far as is possible, while still conveying the outcomes of the technical assessments undertaken. Due to the scale and complex nature of the M4-M5 Link project, this has in some cases resulted in large EIS chapters and technical documents. The EIS does include an executive summary that provides an overview of the key impacts/benefits and management and mitigation measures. In addition to the EIS, a guide to the EIS and factsheets[1] on the project, have been written in plain English, to make the project information more accessible. Personnel, including subject matter experts, were available at community information sessions to assist the community in understanding the project impacts presented in the EIS.

Roads and Maritime has endeavoured to use less technical terms and jargon and more common language in the EIS, where possible. The document has been reviewed by technical editors and communications personnel with the intent of making the document readable for the general public.

The great majority of the content of both the air quality assessment report (Appendix I (Technical working paper: Air quality)) and Chapter 9 (Air quality) of the EIS was focused on the ambient air quality, ie the impact of the surface road traffic and emissions from the ventilation outlets, with the remainder reporting on the assessment of in-tunnel air quality.

C9.1.2 Analysis of particulates not adequately assessed

Submitters expressed concern about the adequacy of the air quality impact assessment relating to particulates. Specific concerns included:

- The air quality assessment does not meet Australian standards as the air quality monitoring station at the Rozelle NSW Office of Environment and Heritage (OEH) site does not measure $PM_{2.5}$
- The air quality analysis fails to take into account fine particulate pollution
- The EIS stated the contribution of car exhaust to the total air pollution for the Sydney metropolitan area is minor (0.75 per cent). However, there are other non-exhaust particulates emitted by vehicles (5.5 per cent), light diesel exhaust (2.2 per cent) and other industrial vehicles and equipment (1.4 per cent) which would mean total vehicle emissions is almost 10 per cent
- Reason for locality based particulate matter burden referred to in the EIS
- The scale of the air quality problem is unknown - particulates in the air are likely to impact a far wider area than the inner city alone.

Response

Governance of particulate emissions

The ambient air quality assessment was undertaken using criteria, or levels of pollutants, that have been adopted by the NSW Government.

The project was assessed using current air quality criteria listed in the updated NSW Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA 2016) (NSW Approved Methods). The updated NSW Approved Methods adopted the National Environment Protection (Ambient Air Quality) Measure (AAQNEPM) standards that were updated in 2016. The national standards were developed to provide 'adequate protection of human health and wellbeing'.

[1] https://www.westconnex.com.au/general-search?s=factsheet

The AAQNEPM was amended in February 2016 relating to particulate matter (PM) with the main changes being as follows (National Environment Protection Council (NEPC) 2016):

- The advisory reporting standards for $PM_{2.5}$ were converted to formal standards
- A new annual average PM_{10} standard of 25 micrograms per cubic metre ($\mu g/m^3$) was established
- An aim to move to annual average and 24 hour $PM_{2.5}$ standards of seven $\mu g/m^3$ and 20 $\mu g/m^3$ by 2025 was included
- A nationally consistent approach to reporting population exposure to $PM_{2.5}$ was initiated
- The existing five-day allowed exceedance of the 24 hour $PM_{2.5}$ and PM_{10} standards was replaced with an exceptional event rule.

Ultrafine particulates

There are currently no standards for assessment of 'ultrafine' particles (UFPs). These are particles with a diameter of less than 0.1 micrometres (µm). While there is some evidence that particles in this size range are associated with adverse health effects, there are no air quality standards or methodologies to assess the potential health impacts for UFPs. The World Health Organisation (WHO) Regional Office for Europe (2013) has stated the following:

'…the richest set of studies provides quantitative information for $PM_{2.5}$. For ultrafine particle numbers, no general risk functions have been published yet, and there are far fewer studies available. Therefore, at this time, a health impact assessment for ultrafine particles is not recommended.'

As UFPs are a subset of $PM_{2.5}$, any potential health effects from UFPs are included in the dose-response functions for $PM_{2.5}$. For the purpose of the project air quality assessment it is considered that the effects of UFPs on health are included in the assessment of $PM_{2.5}$.

WHO recommends (WHO Regional Office for Europe 2013) that current efforts to:

'reduce the numbers of UFPs in vehicle emissions should continue and, until there is clearer evidence of the concentration-effect relationship for UFPs, management of PM should continue to focus on PM_{10} and $PM_{2.5}$.'

Assessment of particulates

Computer models calibrated to local conditions have been used to predict changes in ambient air quality arising from the project and other planned infrastructure projects, so that changes in local and regional air quality can be assessed. The models incorporate meteorology, local topography, the emissions from the future vehicle fleet and the physical characteristics of the motorway, including the tunnel portals and ventilation outlets, and the broader road network. In its submission on the EIS, NSW Health (see **section B11.1.1**) concluded that:

'We find that the assessment methodology is sound and represents best practice. All of the models and data used are appropriate and expertly used'.

Data from monitoring stations in the air quality assessment study area were used to determine existing background levels of particulates for the air quality assessment. For baseline scenarios, background air quality data was collected from representative monitoring stations in urban areas.

In general terms, different sites across Sydney show similar air quality trends for particulates. Therefore, the values used from these sites are valid for use across the project even when the monitoring sites are some distance from any specific suburb such as Rozelle. There are a number of reasons for this:

- The key purpose of the air quality assessment is to establish the changes to air quality as a result of the project, and these can only be predicted using models. The background is assumed to be unchanged with or without the project, so small variations in the background levels will not affect the outcome of the assessment

- Using current background information for future air quality scenarios (beyond 2023) is a conservative estimate. Based on trends over the last few decades, the contribution of road vehicles to pollution levels in Sydney has fallen. This is because of improvements to fuels and pollution management systems on vehicles. New less polluting vehicles replace older polluting vehicles overtime. This has led to a reduction in vehicle generated pollution even with traffic growth and it is expected that this will continue to happen for some time into the future. Although particulate matter from non-exhaust sources, such as brake and tyre wear will continue to be produced, the overall levels of particulate matter will reduce as the exhaust component of emissions reduces.

Table 9-8 of the EIS provides a full list of community receptors (CR) considered in the air quality assessment. Annexure K of Appendix I (Technical working paper: Air quality) of the EIS provides detailed findings for each community receptor listed. Table K-29 to Table K-57 provides details for PM_{10} and $PM_{2.5}$ maximum 24 hour mean and annual mean concentrations for each community receptor.

C9.1.3 Concern regarding the adequacy of data used to support the assessment of air quality

Submitters expressed concern about the adequacy of data used to support the air quality impact assessment and how this affects the quality of the assessment.

Specific concerns relating to the traffic assessment included that the assessment does not adequately include significant numbers of diesel vehicles (4WD's) being driven in the inner west.

Specific concerns relating to vehicle emissions included:

- Air quality modelling is based on assumptions with improvements to in-vehicle technology and fuel, however standards for heavy vehicles, which contribute significantly to NO_X emissions and ozone, have been postponed
- Air quality scenarios should test current per vehicle emissions against current criteria or test forecast reductions in emissions against forecast air quality criteria
- Assumptions relied on questionable traffic modelling as estimates of future vehicle emissions are inaccurate due to uncertainty in future vehicle emission reductions and does not factor in the increase in diesel vehicle usage
- Error in EIS with its statement on petrol-powered vehicles sourcing 0.75 per cent of $PM_{2.5}$ in Sydney, less than fireplaces. The EIS then refers to a figure that shows a total of 13.75 per cent of $PM_{2.5}$ emissions
- Reliance upon historical claims is not satisfactory. Chief Scientist data stops at 2009 and has not been updated to reflect latest vehicle emission data.

Specific concerns relating to the baseline monitoring included:

- The air quality modelling should be supported by evidence and empirical data rather than based on opinions and assumptions that produce indicative outcomes
- None of the air quality modelling is based on data recorded at the affected sites
- Air quality impacts have been inadequately modelled as no baseline testing has been undertaken
- The air quality monitoring station on Callan Street does not measure $PM_{2.5}$, does not meet Australian Standards and the closest OEH site is at Earlwood (10 kilometres from the study area), therefore there is no long term data to produce a meaningful model. Particular concerns relate to the impacts at Rozelle Public School
- State averages were used as a baseline for air quality data for Rozelle, rather than local averages
- Considering there is no monitoring of $PM_{2.5}$ close to Rozelle Public School currently, how will the impacts on air quality be identified during construction and operation
- Pollution from fires and dust storms.

Specific concerns relating to the meteorological data included:

- Air quality simulations are not sufficient and should use detailed computer simulations including details of grid scale, turbulence modelling and other effects such as temperature inversions

- Inadequate information about the use of meteorological data and particularly modelling of wind direction. In Appendix H there are statements about the use of meteorological data and the choice of a particular weather station: Canterbury 066194 - there is little information shown about what data from that weather station is used or how.

Response

Traffic assessment

The key strategic transport planning model used in the Sydney greater metropolitan area is the Strategic Travel Model (STM), which is managed by Transport for NSW Transport Performance and Analytics. The STM is used as the basis for the project traffic modelling and includes the capability to address future changes in land use, trip distribution and mode choice as well as producing traffic demand during peak and off peak periods. The STM was used as the basis for developing the WestConnex Road Traffic Model version 2.3 (WRTM v2.3) used for the EIS, which predicts the future growth in road traffic demands for a more detailed transport and pricing scenario traffic model for the project.

Traffic modelling for the project aimed to make best use of available traffic count data and modelling software to determine base and future traffic conditions for the project study area and surrounding road network (in terms of estimating travel demand and traffic volumes). Traffic counts provided actual vehicle volumes and traffic flow data for the baseline year. These traffic conditions were then used to assess the operational performance of the network, in scenarios with and without the project.

In September 2016, Roads and Maritime prepared a forecast of the on-road NSW vehicle fleet, taking into account trends in vehicle registrations, vehicle age and vehicle kilometres travelled for each vehicle category. This forecast enables predictions of vehicle emissions for future road tunnel projects up to the year 2040.

Vehicle emissions

The emissions factors for light duty vehicles used for the ambient air quality modelling were based on the NSW EPA emissions model, which is based on real-world monitoring data, and not based on manufacturers specifications. The emission model/emission data (Permanent International Association of Road Congresses (PIARC)) was updated in 2012. No data from the Chief Scientist from 2009 has been used.

In order to combine the emission factors in the models with traffic data, information was also required on the fuel split (petrol/diesel) for light vehicles, and the sub-division of heavy vehicles and buses. The fuel splits were originally provided by NSW EPA for the road types included in the emission model, and these splits were used in the assessments for the M4 East and New M5 projects. More recently, Roads and Maritime has provided a revised fleet model[2] to support the calculation of in-tunnel emissions for the M4-M5 Link project.

The modelling of vehicle emissions used in the air quality assessment considered not only the current fleet, but included assumptions about the likely growth and change in the fleet. Even though there is a delay in implementation of Euro 6/VI standards for passenger cars and heavy vehicles respectively, all new vehicles in Australia are imported and most would be manufactured to the European standards, since that is much larger market than Australia. This means the vehicle emissions in Australia will continue to improve even with the delayed implementation of the latest standards. The emissions prediction used in the air quality assessment, and therefore the future air quality and ventilation outlet emissions forecast in the air quality modelling, were scaled to be conservative (see responses in **section B3.2.3**).

The submission which refers to ‘petrol-powered vehicles sourcing 0.75 per cent of $PM_{2.5}$ in Sydney, less than fireplaces and a total of 13.75 per cent of $PM_{2.5}$ emissions’ is incorrect. These figures are not stated in the EIS. Section 9.5.4 of the EIS states the breakdown of emissions in 2011 from the road transport sector by process and vehicle type. Petrol passenger vehicles (mainly cars) accounted for a large proportion of the vehicle kilometres travelled (VKT) in Sydney. Exhaust emissions from these vehicles were responsible for 62 per cent of CO from road transport in Sydney in 2011, 45 per cent of oxides of nitrogen (NO_X), and 76 per cent of sulphur dioxide. They were a minor source of PM_{10} (four per cent) and $PM_{2.5}$ (nine per cent). Non-exhaust particulates, eg particles from brake lining wear and tyre wear, were the largest source of road transport PM_{10} (60 per cent) and $PM_{2.5}$ (46 per cent).

[2] https://www.westconnex.com.au/local-updates?default_view=2&project=14&updates=9

Baseline monitoring

Monitoring stations in the air quality assessment study area were used to determine appropriate background and roadside levels for the air quality dispersion modelling. For baseline scenarios, background air quality data was collected from representative monitoring stations in urban areas. Data was available between 2004 and 2015 from monitoring stations. This data was used to develop the baseline year (2015) modelling scenario. The baseline data includes emissions from existing sources such as fires and dust storms.

In addition, a network of air quality monitoring stations managed by Roads and Maritime were specifically established to support the M4 East, New M5 and M4-M5 Link projects. Some of the stations are located at urban background sites and others are located so as to characterise population exposure near busy roads. Monitoring at a number of these sites is ongoing.

Reference monitoring sites for road tunnels have been selected to analyse changes associated with the operation of tunnels. Monitoring of Lane Cove Tunnel, Cross City Tunnel and the M5 East tunnel has been considered in the assessment as reference sites for this project.

Table C9-1 (see Table F-1 Annexure F of Appendix I (Technical working paper: Air quality) of the EIS) lists the location, type and duration of use for each monitoring station and which are operated by OEH, Roads and Maritime and SMC. Air quality monitoring reports for the project are available to the public via the WestConnex website[3]. The OEH Rozelle monitoring station is located approximately 580 metres to the west of the Rozelle Public School. This site was used to characterise background air quality in this area. Figure F-1 in Annexure F of Appendix I (Technical working paper: Air quality) of the EIS shows the locations of the air quality monitoring stations.

Table C9-1 Air quality monitoring stations

Organisation and project (where relevant)	Site name	Location	Site type	Period covered in analysis	Status as of September 2016
OEH	Chullora	Southern Sydney TAFE - Worth Street	Urban background	Jan 2004 to Jun 2016	Operational
	Earlwood	Beaman Park	Urban background	Jan 2004 to Jun 2016	Operational
	Lindfield	Bradfield Road	Urban background	Jan 2004 to Jun 2016	Operational
	Liverpool	Rose Street	Urban background	Jan 2004 to Jun 2016	Operational
	Prospect	William Lawson Park	Urban background	Jan 2004 to Jun 2016	Operational
	Randwick	Randwick Barracks	Urban background	Jan 2004 to Jun 2016	Operational
	Rozelle	Rozelle Hospital	Urban background	Jan 2004 to Jun 2016	Operational
Roads and Maritime	M5E: Community Background Monitoring Station (CBMS)	Gipps Street, Bardwell Valley	Urban background	Jan 2008 to Jun 2016	Operational

[3] https://www.westconnex.com.au/local-updates?default_view=2&project=14&updates=9

Organisation and project (where relevant)	Site name	Location	Site type	Period covered in analysis	Status as of September 2016
M5 East tunnel	M5E: T1	Thompson Street, Turrella	Urban background	Jan 2008 to Jun 2016	Operational
	M5E: U1	Jackson Place, Earlwood	Urban background	Jan 2008 to Jun 2016	Operational
	M5E: X1	Wavell Parade, Earlwood	Urban background	Jan 2008 to Jun 2016	Operational
	M5E: F1	Flat Rock Rd, Kingsgrove (M5 East F'way)	Peak (roadside)	Jan 2008 to Jun 2016	Operational
	M5E: M1	M5 East tunnel portal	Peak (roadside)	Jan 2008 to Jun 2016	Operational
Roads and Maritime NorthConnex	NC-01	Headen Sports Park	Urban background	Dec 2013 to Jan 2015	Decommissioned (Feb 2015)
	NC-02	Rainbow Farm Reserve	Urban background	Dec 2013 to Jan 2015	Decommissioned (Feb 2015)
	NC-03	James Park	Urban background	Dec 2013 to Jan 2015	Decommissioned (Feb 2015)
	NC-04	Observatory Park	Peak (roadside)	Dec 2013 to Jan 2015	Decommissioned (Feb 2015)
	NC-05	Brickpit Park	Peak (roadside)	Dec 2013 to Jan 2015	Decommissioned (Feb 2015)
Roads and Maritime Lane Cove Tunnel	Aristocrat	Longueville Road / Epping Road	Peak (roadside)	Oct 2008 to Nov 2009	Decommissioned 2009
SMC	M4E: 01	Wattle Street, Haberfield	Peak (roadside)	Aug 2014 to Mar 2016	Relocated to M4-M5 Link (Mar 2016)
WestConnex M4 East	M4E: 02	Edward Street, Concord	Peak (near-road)[1]	Sep 2014 to Mar 2016	Relocated to M4-M5 Link (Mar 2016)
	M4E: 03	Bill Boyce Reserve, Homebush	Peak (near-road)[1]	Sep 2014 to Mar 2016	Decommissioned (Mar 2016)
	M4E: 04	Concord Oval, Concord	Peak (roadside)	Nov 2014 to Feb 2017	Operational
	M4E: 05	St Lukes Park, Concord	Urban background	Nov 2014 to Feb 2017	Operational

Organisation and project (where relevant)	Site name	Location	Site type	Period covered in analysis	Status as of September 2016
SMC WestConnex New M5	New M5: 01	St Peters Public Sch., Church St, St Peters	Urban Background	Aug 2015 to Feb 2017	Operational: retained for M4-M5 Link
	New M5: 02	Princes Highway, St Peters	Peak (roadside)	Jul 2015 to Feb 2016	Decommissioned (Apr 2016)
	New M5: 03	West Botany St, Arncliffe	Peak (roadside)	Aug 2015 to Jun 2016	Decommissioned (Sep 2016)
	New M5: 04	Bestic St, Rockdale	Urban background	Jul 2015 to Jun 2016	Decommissioned (Sep 2016)
	New M5: 05	Bexley Rd, Kingsgrove	Peak (roadside)	Jul 2015 to Feb 2016	Decommissioned (Apr 2016)
	New M5: 06	Beverly Hills Park, Beverly Hills	Urban background	Jul 2015 to Jun 2016	Decommissioned (Sep 2016)
	New M5: 07	Canal Rd, St Peters	Peak (road/industrial)	Jul 2015 to Feb 2016	Decommissioned (Apr 2016)
SMC WestConnex M4-M5 Link	M4-M5: 01	Rozelle, City West Link	Peak (roadside)	Apr 2016 to Feb 2017	Operational
	M4-M5: 02	Haberfield, Ramsay Street	Peak (roadside)	Apr 2016 to Feb 2017	Operational

Note:
1 Due to practical constraints at this location, the monitoring site is some distance from the closest major road (M4 motorway). Nevertheless, the monitoring station should adequately characterise exposure to air pollution at nearby properties.

Air quality data from a number of the sites noted in **Table C9-1** was assessed and analysed within the EIS. In general terms, different sites across Sydney showed similar air quality trends (improvements over time) and similar pollution levels when not influenced by local pollution sources (eg busy roads or industrial sites). Therefore, the values used from these sites are valid for use across the project. There are a number of reasons for this:

- The key purpose of the air quality assessment is to establish the changes to air quality as a result of the project, and these can only be predicted using models. The background is assumed to be unchanged with or without the project, so small variations in the background levels will not affect the outcome of the assessment
- Using existing background information now for the future (beyond 2023) is a conservative estimate. Based on trends over the last few decades, the contribution of road vehicles to pollution levels in Sydney has fallen. This is because of improvements to fuels and pollution management systems on vehicles. New less polluting vehicles replace older polluting vehicles over time. This has led to a reduction in vehicle generated pollution even with traffic growth and it is expected that this will continue to happen for some time into the future.

The ACTAQ peer review noted that despite some limitations, the assessment of background air quality was considered to be acceptable and fit for purpose (see **section B3.1.1**). ACTAQ made the following comment on the adequacy of baseline data:

'In common with previous WestConnex and NorthConnex projects considerable funds have been spent on air quality monitoring, putting the M4-M5 Link in the enviable position of having a far richer observational dataset available than most, if not all, comparable projects. Within this context, therefore, the assessment of background air quality in this EIS may be seen as good rather than best practice.'

A detailed assessment of all available data was undertaken for the EIS. Refer to Annexure F of Appendix I (Technical working paper: Air quality) of the EIS for existing air quality and background concentrations.

Air quality modelling and meteorological data

The operational ambient air quality assessment was based upon the use of the Graz Mesoscale Model (GRAMM-GRAL) model system. The model system consists of two main modules: a prognostic wind field model (Graz Mesoscale Model – GRAMM) and a dispersion model (GRAL). Terrain data used in the air quality model for Sydney were obtained from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) website and was based on 30 metre resolution data (grid scale).

As part of the air quality impact assessment, likely worst case scenarios were taken into account by using a sophisticated meteorological and dispersion model utilising a full year of meteorological data. This included assessment of localised accumulation of pollutants under low wind speeds. Meteorological information included in the modelled scenarios included wind direction, wind speed, calms/low wind speed conditions, and temperature inversions, were used to model the peak concentration of air pollutants that may occur.

Further detail on the meteorological data used and how it was incorporated into the air quality modelling is provided in Appendix I (Technical working paper: Air quality) of the EIS.

C9.2 Level and quality of construction air quality assessment

105 submitters raised concerns about the methodology or adequacy of construction air quality assessment. Refer to section 9.3 and Appendix I (Technical working paper: Air quality) of the EIS for details of the assessment methodology.

C9.2.1 Concern regarding methodology and adequacy of assessment of air quality during construction

Submitters expressed concern about the adequacy and independence of the air quality impact assessment and how it addresses the impacts of emissions from construction vehicles and dust during construction. Specific concerns included:

- The traffic and air quality modelling should be independently peer reviewed by an academic or public health expert
- Request for details of the prevailing wind and other relevant weather conditions at the St Thomas Child Care Centre for each day in the past year
- Request for air quality particulates, including exhaust emissions, from on-site plant equipment and trucks to be assessed during construction
- Lessons learnt during Stage 1 and 2 of WestConnex are not adequately referenced and included in the Stage 3 [M4-M5 Link] assessment
- The EIS did not take into account the cumulative impact of emissions from spoil truck vehicles from the Darley Road civil and tunnel site (C4) and emissions from aircraft
- The air quality assessment, in relation to Darley Road civil and tunnel site, fails to comply with the SEARs requirements. In particular that the project is designed, constructed and operated in a manner that minimises air quality impacts.

Submitters were also concerned that insufficient data was used in the air quality construction assessment for it to be considered reliable. Specific concerns regarding missing data included that the number of receptors has been underestimated at 500. Submitter believes the number would be well over 800 on any given day.

Response

The EIS was prepared by a team of qualified professionals and peer reviewers and presented a balanced merit-based environmental impact assessment in accordance with the EP&A Act, the Environmental Planning and Assessment Regulation 2000 (NSW), the SEARs and applicable NSW assessment policies (see **section C9.1.1** for further details).

The EIS included a technical working paper on air quality which was prepared in accordance with the key issues identified in the SEARs which included requirements issued by key government regulatory agencies as well as industry standards and guidelines. NSW Government agencies and bodies were consulted during the development and preparation of the air quality assessment for the project.

The EIS, including Appendix I (Technical working paper: Air quality) of the EIS, was reviewed by DP&E to confirm that it adequately addressed the SEARs prior to being placed on public exhibition. DP&E also commissioned an independent technical peer review of the air quality assessment to inform its assessment of the EIS. Appendix I (Technical working paper: Air quality) of the EIS was also reviewed by specialists from key government agencies including NSW EPA, NSW Health and ACTAQ (see **section C9.1.3**).

Feedback from SMC, contractors, DP&E and other relevant government agencies, including NSW EPA, was sought on the M4 East and New M5 construction processes to identify lessons learnt and areas for improvements to work processes and mitigation measures. This feedback, together with issues raised by the community during the construction stages of those projects to date and during consultation for the M4-M5 Link, has been considered in the preparation of the EIS, Conditions of approval for the M4 East and New M5 projects informed the environmental management measures for the M4-M5 Link. In addition, the in-tunnel emissions for the future years were estimated using the detailed PIARC method based on the local fleet emissions factors which is a change from the M4 East and New M5 EISs which used the simple PIARC method.

In total, 86,375 residential, workplace and recreational receptors were included in the assessment. This included the 40 community receptors which were representative of the other community receptors potentially affected by the project.

The air quality assessment considered the potential impacts during construction of the project. Potential impacts on local air quality during construction from dust were assessed using a risk-based approach for construction dust, which determined that standard management measures would be sufficient to mitigate the effects of construction work on local air quality and the community. Emissions from Sydney Airport, associated flight paths and the White Bay cruise ship terminal were included in the existing baseline air quality and were therefore accounted for in all future scenarios modelled, including cumulative scenarios.

The risks associated with construction dust emissions were assessed for four types of activity: demolition, earthworks, construction, and emissions from construction vehicles leaving the construction sites. The assessment methodology considered three separate dust impacts: annoyance due to dust soiling, the risk of health effects due to an increase in exposure to PM_{10}, and harm to ecological receptors.

The type of vehicles and equipment used at construction ancillary facilities would be selected by the design and construction contractor(s). The environmental management measures proposed in **Chapter E1** (Environmental management measures) are considered to be sufficient to mitigate the effects of construction work on local air quality and the community.

Also refer to the responses in **section C9.2.2** and **section C9.3** to **section C9.6**.

All relevant air quality monitoring results will be made available to the public on the WestConnex website[4]. This website also provides historic data which includes meteorological data associated with air quality monitoring. Meteorological data is also available direct from the Bureau of Meteorology[5].

C9.2.2 Concern regarding the air quality assessment process for Rozelle

Submitters expressed concern about how the air quality impact assessment addresses the impacts of emissions during construction at receptors in Rozelle.

- Concern whether the removal of buildings at Rozelle have been accounted for in the air quality assessment
- No baseline data has been recorded and therefore it can't be determined if there are changes to air quality following construction at the school (Rozelle Public School) along Victoria Road (the closest baseline data is for the Rozelle Rail Yards).

Response

The methodology for the construction air quality assessment is outlined in Chapter 7 of Appendix I (Technical working paper: Air quality) of the EIS. The main air pollution and amenity considerations for the assessment process for construction ancillary facilities are:

- Annoyance due to dust deposition (eg soiling of surfaces at residences) and visible dust plumes

[4] https://www.westconnex.com.au/local-updates?default_view=2&project=14&updates=9
[5] http://www.bom.gov.au/

- Elevated PM_{10} concentrations due to on-site dust-generating activities
- Increased concentrations of airborne particles and NO_2 due to exhaust emissions from on-site diesel-powered vehicles and construction equipment. Exhaust emissions from on-site plant and site traffic are unlikely to have a significant impact on local air quality and, in the majority of cases, they do not need to be quantitatively assessed.

The assessment of construction dust comprised several steps (refer to section 7.3 of Appendix I (Technical working paper: Air quality) of the EIS) to screen the types of activities, the nature of impact and the sensitivity of a receptor. The assessment considered both the impacts from dust soiling and health impacts. **Figure C9-1** illustrates these steps.

The risks associated with construction dust emissions were assessed in the EIS for four types of activity and the main equipment used: demolition (including removal of buildings at Rozelle), earthworks, construction, and from construction vehicles exiting construction sites.

Step 2B comprised defining the sensitivity of the receptor/location which could be impacted. Receptors identified included residential, community (such as Rozelle Public School (CR31) and businesses. The sensitivity of the area takes into account the specific sensitivities of local receptors, the proximity and number of the receptors, and the local background PM_{10} concentration.

During step 3, site specific mitigation measures are developed which take account of the sensitivity of the receptors identified in step 2B.

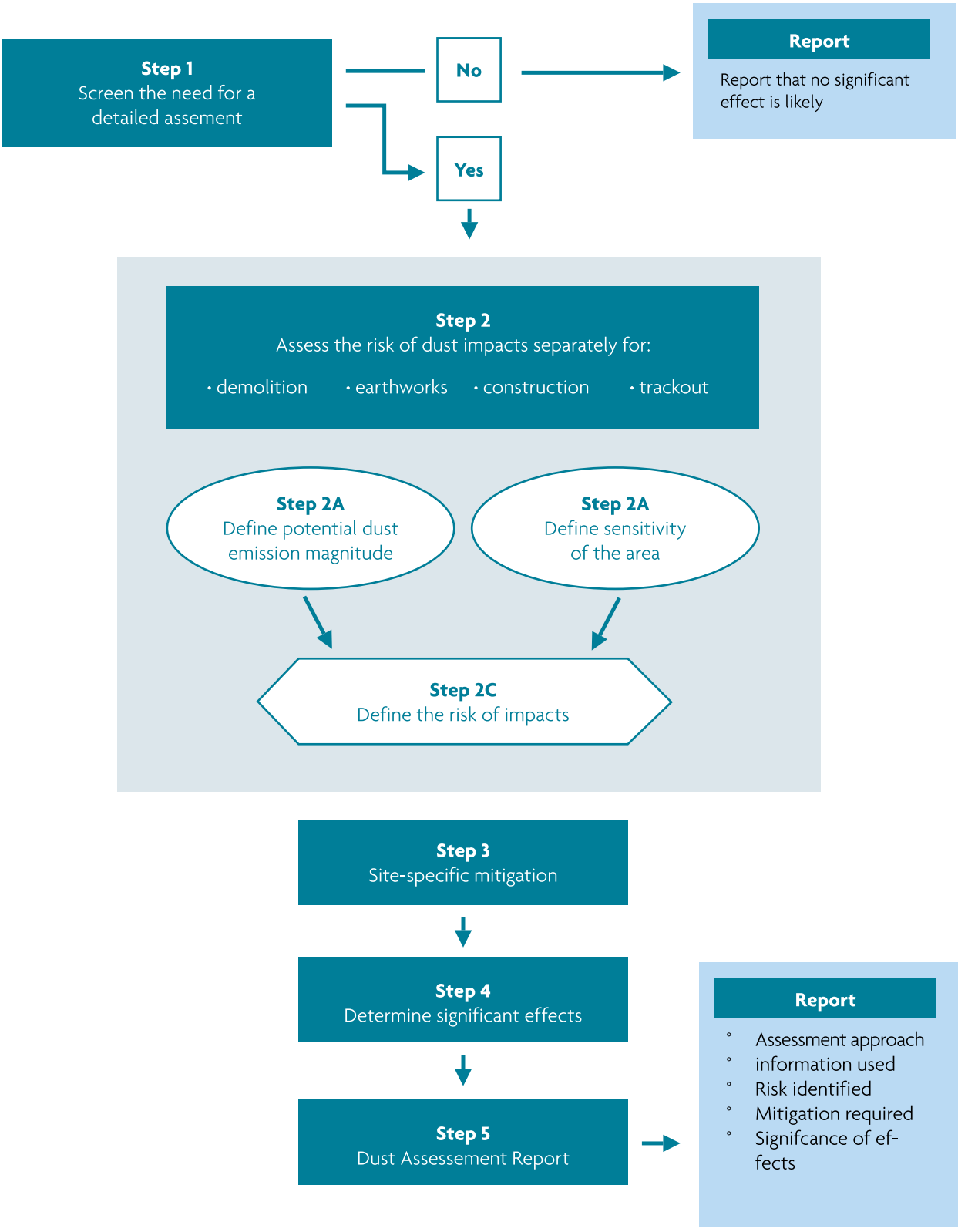


Figure C9-1 Steps in an assessment of construction dust (IAQM 2014)

C9.3 Dust generation during construction

296 submitters raised concerns about impacts to air quality as a result of dust emissions during construction. Refer to section 9.6 of the EIS and Chapter 7 of Appendix I (Technical working paper: Air quality) for details of the findings of the construction assessment.

C9.3.1 Generation of dust from construction activities

Submitters raised concern regarding the impacts of dust generated during construction. Specific concerns related to dust generated from:

- Tunnelling and spoil haulage activities including at Parramatta Road west civil and tunnel site, Parramatta Road East civil site (C3b) and the Darley Road civil and tunnel site (C4)
- Demolition of existing buildings, specifically at Rozelle
- Earthworks including cut-and-cover tunnelling at Haberfield and St Peters disturbing contaminated areas and resulting in toxic dust
- Jackhammering
- Traffic movement such as construction vehicles utilising local roads and worker parking at the Darley Road civil and tunnel site
- The unacceptable levels of dust caused by the 24 hour, five year long period of tunnel construction under affected suburbs
- Option B carries a much greater risk to release dust and other pollutants in the air than Option A
- Disagree that dust impacts will be 'short-lived', as this has not been the experience of residents at Haberfield and Ashfield.

Specific concern related to dust at the following receptors:

- Rozelle Public School, Haberfield Public School and Bridge Road School
- Residential properties at St Peters, Rozelle, Marrickville, Lilyfield, Haberfield, North Annandale, Ashfield, Camperdown and Leichhardt
- Other receptors: Camperdown Commons (urban farm), Royal Prince Alfred Hospital and the [James Squire] Malt Shovel Brewery.

Response

The main air quality impact on receptors during construction would be from dust. The risks associated with construction dust emissions were assessed in the EIS for four types of activity and the main equipment used: demolition, earthworks (including tunnelling), construction, and from construction vehicles exiting construction sites. The assessment methodology considered three separate dust impacts: annoyance due to dust soiling, the risk of health effects due to an increase in exposure to PM_{10}, and harm to ecological receptors. Identification of receptors included in the assessment are discussed in **section C9.2.2**.

The results of the air quality assessment in relation to construction dust, was discussed in section 9.6.2 of the EIS. For dust soiling impacts, the sensitivity of all areas and all activities was determined to be 'high'. For human health impacts, the sensitivity of all areas and all activities was determined to be 'medium'. For ecological impacts, the sensitivity of activities and areas was either 'medium' or 'low'.

Several locations and activities were determined to be of high risk. The assessment found the highest risk of dust impacts would be associated with demolition works at Rozelle and Annandale for the establishment of construction ancillary facilities. Consequently, a wide range of management measures has been recommended to mitigate the effects of construction works on local air quality at the impacted receptors. These measures will be implemented where community or residential receptors may be impacted from construction ancillary facilities at St Peters, Rozelle, Marrickville, Lilyfield, Haberfield, North Annandale, Ashfield, Camperdown and Leichhardt and along construction traffic haulage routes. This would minimise potential impacts to Rozelle Public School, Haberfield Public School and Bridge Road School and other receptors such as Camperdown Commons urban farm, Royal Prince Alfred Hospital and the James Squire Brewery.

In addition to the environmental management measures, the project would include acoustic sheds at construction ancillary facilities which would surround tunnelling activities. Acoustic sheds are proposed at the Parramatta Road West civil land tunnel site (C1b) which is close to the Haberfield Public School, and at the Pyrmont Bridge Road tunnel site (C9) which is close to Bridge Road School, the James Squire Brewery and the Royal Prince Alfred Hospital. These sheds would reduce dust being emitted from the tunnelling activities being undertaken at these locations.

Spoil would be transported from construction ancillary facilities to spoil management locations, generally along arterial roads and the M4 East Motorway, the New M5 Motorway, the M5 East Motorway and the M5 South West Motorway. The use of these haulage routes and the covering of truck loads would reduce potential for emissions of dust along haul routes and surrounding residential areas. Spoil haulage routes would use the M4 East and New M5 tunnels as far as practicable in order to minimise heavy vehicles using the surface road network. Spoil haulage routes would take advantage of the M4 East and New M5 tunnels as far as practicable in order to minimise heavy vehicles using the surface road network.

Management measures to prevent the generation and emission of dust and air pollutants during construction are described in **Chapter E1** (Environmental management measures). These include undertaking regular site inspections to monitor dust generation and emissions at each construction site and installation of controls to reduce the emission of dust outside of the acoustic sheds.

A Construction Air Quality Management Plan (CAQMP) will be prepared for the project as a sub-plan to the Construction Environmental Management Plan (CEMP) and will describe how these management measures would be implemented during construction to minimise dust and air pollutant emissions.

Five construction ancillary facilities have been identified at Haberfield/Ashfield. The appointed design and construction contractor(s) may choose to use all or some of the construction ancillary facilities identified in the EIS. Further, additional ancillary facilities may be proposed by the contractor. Criteria that would be considered for identifying alternative locations are described in section 4.6.2 of the EIS. Prior to the establishment of ancillary facilities that are not identified in this EIS, the contractor would need to satisfy any relevant conditions of approval. An Ancillary Facilities Management Plan (AFMP) will be developed to outline the environment management practices and procedures for the establishment and operation of the new construction ancillary facilities. The conditions of approval would detail requirements for inclusion in the AFMP, which would include consultation with DP&E and other relevant stakeholders, such as councils. The AFMP will require approval from the Secretary of DP&E prior to facility operation.

C9.4 Emissions from plant and equipment during construction

456 submitters raised concerns about impacts to air quality as a result of emissions from equipment during construction. Refer to section 9.6 of the EIS and Chapter 7 of Appendix I (Technical working paper: Air quality) for details of the findings of the construction assessment.

C9.4.1 Impacts on air quality from construction vehicles and equipment

Submitters raised concern regarding the air quality impacts from construction vehicles and equipment. Specific concerns related to emissions from:

- Activities at the Iron Cove Link civil site, Parramatta Road West civil site and Darley Road civil and tunnel site (due to increased congestion and high revs needed to travel up the steep incline)
- Construction equipment including temporary ventilation facilities and off-road diesel generators used on construction sites
- 24 hour truck movements to remove tunnel spoil
- Construction traffic such as increased traffic and congestion around the Rozelle interchange and surrounding streets, spoil trucks at the intersection of James Street/City West Link, diesel trucks moving spoil along Victoria Road and 517 movements including 46 peak hour movements at the Rozelle Rail Yards.

Specific concern related to emissions at the following receptors:

- Haberfield Public School, Rozelle Public School and various childcare centres
- Camperdown Commons urban farm
- Residential properties at Haberfield, Rozelle, Balmain and St Peters
- Receptors in the vicinity of The Crescent, Johnston Street, Catherine Street, Ross Street, Lilyfield Road and along narrow streets around construction sites
- Residents, community facilities, services and businesses around construction sites and on the Balmain Peninsula.

Response

The type of vehicles and equipment used at construction ancillary facilities would be confirmed by the design and construction contractor(s). A worst case scenario has been considered for emissions from construction vehicles and equipment. Environmental management measures identified consider the use of construction vehicles and equipment within all the construction ancillary facilities and off-site on haul routes. It is considered that these measures would be sufficient to mitigate the effects of construction work on local air quality and the community.

Management measures to prevent the generation and emission of air pollutants from equipment and vehicles during construction are described in **Chapter E1** (Environmental management measures). A CAQMP will be prepared for the project which will include management measures and procedures to guide its implementation during construction to minimise diesel emissions. These measures will include:

- All construction vehicles and plant will be inspected regularly and maintained to ensure that they comply with relevant emission standards
- Engine idling will be minimised when plant is stationary and plant will be switched off when not in use to reduce emissions
- The use of mains electricity will be favoured over diesel or petrol powered generators where practicable to reduce site emissions.

Refer also to the responses in **section C9.3.1** for further discussion relating to dust.

C9.5 Odour impacts during construction

592 submitters raised concerns about impacts to air quality from odour as a result of construction. Refer to section 9.9 of the EIS and section 8.6 of Appendix I (Technical working paper: Air quality) for details of the odour assessment and findings.

C9.5.1 Generation of odour during construction

Submitters raised concern regarding the air quality impacts from odour created during the construction phase. Specific concerns and queries raised included:

- Odours exposed from tunnelling and the stockpiling of excavated material
- Residential properties will be subjected to unacceptable odours during the construction phase.

Specific concerns related to odours experienced at the following receptors:

- Haberfield Public School
- Residents from around the Parramatta Road West civil and tunnel site
- Residents around the Darley Road civil and tunnel site exposed to polycyclic aromatic hydrocarbons, total recoverable hydrocarbons and Volatile Organic Hydrocarbons
- Residents at St Peters continuing to experience odours and toxic pollutants from construction sites used previously for construction of the New M5 project and the St Peters [Alexandria] Landfill.

Response

The air quality impact assessment included consideration of odours created by the project during construction. The assessment considered the change for three of the odorous pollutants identified in the NSW Approved Methods (toluene, xylenes, and acetaldehyde). These pollutants were taken to be representative of other odorous pollutants which could occur from construction vehicles. The findings of the assessment predicted the change of each pollutant was an order of magnitude below the corresponding odour assessment criterion in the NSW Approved Methods. Therefore odour will not be noticeable to receptors from project construction activities. A CAQMP will be prepared for the project as part of the CEMP which will include management measures and procedures that will be implemented during construction (see environmental management measure AQ1).

Appendix R (Technical working paper: Contamination) lists potential contamination from excavations or demolition waste at each of the construction ancillary facilities. Contamination could include hydrocarbons which may have an odour. Removal of contaminated material would be managed through the Construction Waste Management Plan for the project which will include procedures for handling and storing potentially contaminated substances. Mitigation measures would include management and covering of odorous stockpiles.

Construction activities relating to the New M5 project were assessed in the EIS for that project (Roads and Maritime 2016). Mitigation measures for areas impacted by the New M5, including the Alexandria Landfill, were proposed in that EIS and are managed in a CEMP specific to that project.

C9.6 Construction air quality environmental management measures

183 submitters raised concerns about construction related environmental management measures. Refer to **Chapter E1** (Environmental management measures) for details of mitigation proposed to minimise construction impacts.

C9.6.1 Request for increased air quality management measures

Submitters requested increased mitigation measures for air quality during construction. Specific requests included:

- Air quality monitoring to occur prior to and during construction, be independently conducted and in real time. Monitoring results should be made publicly available and regularly provided to the NSW EPA and Inner West Council
- Air quality monitoring to be rotated across residences during the construction period
- More extensive dust prevention and management measures at Rozelle Public School, Haberfield Primary School and other schools and day care centres including:
  - An indoor playground area, when it is too windy or unsafe to play outside, at Haberfield Primary School
  - Air quality monitoring at Haberfield Primary School to be in ‘real time’ to ensure that mechanisms are in place to notify or cease operation if dust reaches unacceptable levels
  - Condition of approval allowing Haberfield Primary School to raise alarm in the event of excessive dust and requiring the proponent to immediately cease or modify activities
  - Works should occur outside of school term times
  - Reducing construction times
- Provision of air conditioning to all homes, businesses, schools and day care centres within 500 metres of construction sites so that all windows can be kept shut to avoid being exposed to airborne pollutants
- More extensive dust and pollution management measures than used on the M4 East project, as watering down and other dust mitigation measures were inadequate, including:
  - A sealed tent to prevent dust from leaving the Darley Road construction site
  - Trucks with excavated material to be watered and covered prior to exiting construction sites

  - The use of vegetation to provide a buffer for sensitive receivers from air pollution
  - Remediation of dust on residents property on an ongoing basis during construction
  - Additional mitigating measures for dust control along Lilyfield Road during construction including a noise barrier (wall) and acoustic sheds
- Written assurance the project will have appropriate arrangement for dust mitigation prior to the project commencing especially around the Rozelle Rail Yards
- A plan detailing actions when air quality becomes unsafe and addressing the unexpected and detrimental effects of construction
- Major tree planting should proceed as soon as possible to buffer potential construction facilities, reduce air borne-pollutant movement and provide some interim amenity to likely affected areas
- Indoor air quality monitoring should occur inside nearby schools and homes, prior to and during the project life
- Severe penalties should be imposed for exceeding approved dust levels during construction by the NSW EPA
- No works should proceed until all dust mitigation measures are in place
- There should be no use of off road diesel equipment (generators) as part of the conditions of approval
- A complaints hotline should be provided to allow residents to report unacceptable dust such that it can be immediately remediated
- A guarantee that cleaning will be performed at residential properties significantly affected by construction dust.

Response

Management measures to minimise the generation and emission of dust and air pollutants during construction are described in **Chapter E1** (Environmental management measures). Controls of dust at source through minimising emissions of dust, are the most effective measure at protecting air quality. These measures would minimise dust deposition on nearby receptors such as Rozelle Public School, Haberfield Primary School, other schools and day care centres. The proposed measures have taken into account lessons learnt and community feedback from other WestConnex projects such as the M4 East and New M5 projects, which are under construction. Management measures will be implemented at all construction ancillary facilities including at the Rozelle Rail Yards.

A CAQMP will be prepared for the project which will describe how these environmental management measures will be implemented prior to and during construction to minimise dust and air pollutant emissions and the site inspections, monitoring and reporting that would be undertaken to demonstrate the effectiveness of the measures. These environmental management measures include the covering of spoil trucks to prevent dust emissions during transportation.

In addition to the environmental management measures, the project includes the following design features which would contribute to reducing dust impacts:

- In developing construction methodologies and a construction program for the project, the aim was to minimise the duration of the construction period while maintaining an acceptable and manageable amenity outcome for surrounding receivers. This required a balance between the speed of construction activities and the ability to reasonably and feasibly manage potential impacts within acceptable noise limits. Opportunities to reduce overall construction timeframes while protecting local amenity would be considered during detailed design and construction planning in consultation with key stakeholders and the community
- All proposed tunnelling sites would include acoustic sheds. These sheds would reduce dust being emitted from the tunnelling activities being undertaken at these locations and will include the installation of controls to reduce the emission of dust outside of the sheds Three acoustic sheds would surround tunnelling activities at the Rozelle civil and tunnel site (C5), one shed would surround activities at the Darley Road civil and tunnel site (C4) and one at the Parramatta Road East civil and tunnel site (C3b), which is close to Haberfield Primary School.

The air quality assessment did not assess indoor air quality at individual residences as every property would be different based on the lifestyle of a household (eg cigarette smoke, cooking and heating methods, and the materials and integrity of the building and its furnishings). The EIS presents the contribution to air pollutants that the project is predicted to make to the ambient or external air quality prior to the individual contribution from lifestyle choices and other sources of pollutants. All relevant air quality monitoring results prior to or during construction will be made available to the public on the WestConnex website[6].

A review of research on the effectiveness of vegetation in reducing air pollution was undertaken as part of an economic analysis of potential air pollution abatement measures to inform the National Plan for Clean Air (Particles) (Boulter and Kalkarni 2013). The conclusion of the review was to advise against the use of vegetation to reduce pollution concentrations in built-up areas at short distances from busy roads. The conclusion was based on the following findings:

- Although some studies reported beneficial effects, these were small in some cases less than five per cent, and mainly due to the turbulence produced by small-leaved evergreen trees and tall shrubs
- The particle sizes captured in densely planted trees were in the range between $PM_{2.5}$ and PM_{10}
- The filtering effect for particles less than 1 $\mu g/m^3$ was negligible
- Closely planted trees act as a windbreak which can reduce dispersion and increase local concentrations as a consequence, and some research models assumed that the increase in concentration due to reduced air circulation is much greater than the filtering effect of the vegetation
- Some vegetation and Australian vegetation in particular, for example, eucalyptus species, is a source of VOCs due to the oils in the leaves.

Other mitigation measures described in **Chapter E1** (Environmental management measures) will be more effective in protecting receptors.

Community consultation during construction, including implementation of a complaints management system, is outlined in **section A2.5**. This will include the operation of a toll free hotline number for communities to raise issues.

Should the project be approved, the proponent (Roads and Maritime) and appointed contractors and sub-contractors must comply with all requirements of the conditions of approval for the project. This will require implementing all of the updated environmental management measures described in this report and other feasible and reasonable measures to prevent and/or minimise any harm to the environment that may result from the construction or operation of the project. The type of vehicles and equipment (ie generators) used at construction ancillary facilities would be confirmed by the design and construction contractor(s), but would meet the requirements of the conditions of approval.

The DP&E compliance team undertakes inspections to ensure projects meet the conditions included in their approvals. This team works closely with the community, local councils and other state and federal government agencies to investigate potential breaches and carry out enforcement where necessary. Enforcement can range from negotiating practical solutions, which could include issuing penalty notices and, in serious cases, criminal prosecutions.

C9.6.2 Queries about what environmental management measures will be implemented during construction

Submitters requested information regarding what environmental management measures will be implemented during construction. Specific concerns and queries included:

- How airborne pollutants from demolition and excavation works will be mitigated
- What are the mitigation and management measures for controlling dust around construction sites such as the Darley Road civil and tunnel site and Pyrmont Bridge Road tunnel site as tunnelling will occur 24 hours a day
- What air quality monitoring will be undertaken before and during construction

[6] https://www.westconnex.com.au/local-updates?default_view=2&project=14&updates=9

- What are the mitigation and management measures for dust from the portal construction at the Rozelle Rail Yards where dust may be contaminated with toxic chemicals
- There are no safeguards to manage the dust that will be caused by the Camperdown construction site [Pyrmont Bridge Road tunnel site (C9)].

What mitigation and management measures for dust will be used to prevent dust impacting the following locations:

- Residents homes
- Haberfield and Ashfield
- Around Toelle Street at Rozelle
- Haberfield Primary School.

Response

Management measures to minimise air quality impacts before and during construction including the generation and emission of dust and air pollutants are described in **Chapter E1** (Environmental management measures). Measures will be implemented at all construction ancillary facilities and construction locations generally. These include undertaking regular site inspections to monitor dust levels and assess the adequacy of the controls implemented. Acoustic sheds would surround tunnelling activities (including portal excavation) at the tunnel sites, including the Pyrmont Bridge Road tunnel site (C9) and the Darley road civil and tunnel site (C4). These sheds would reduce dust being emitted from the tunnelling activities being undertaken at these locations including during works outside standard construction hours.

In addition, spoil would be transported from construction ancillary facilities to spoil disposal locations, generally via arterial roads and the motorway network. The use of the arterial road network and the covering of spoil truck loads would reduce potential for emissions of dust along haul routes and surrounding residential areas. Spoil haulage routes would take advantage of the M4 East and New M5 tunnels as far as practicable in order to minimise heavy vehicles using the surface road network.

A CAQMP will be prepared for the project which will describe how these management measures will be implemented during construction to minimise dust and air pollutant emissions and the monitoring and reporting that would be undertaken to demonstrate the effectiveness of the measures. A summary of the air quality monitoring results from the project air quality monitoring stations is made available to the public on the WestConnex website[7].

Management of contaminated soil at the Rozelle Rail Yards is described in Chapter 16 (Contamination) and in Appendix R (Technical working paper: Contamination) of the EIS. Further responses to the management of contamination at the Rozelle Rail Yards is provided in **section C16.2.1**.

C9.7 Level and quality of operational air quality assessment

978 submitters raised concerns about the assessment methodology used in the EIS. Refer to section 9.4 and Appendix I (Technical working paper: Air quality) of the EIS for details of the air quality assessment methodology.

C9.7.1 Concern regarding the methodology for assessing air quality during operation (general)

Submitters expressed concern about the methodology, adequacy and scope of the air quality impact assessment applied for the operation phase of the project. Specific concerns and queries included:

- Independent review of the air quality assessment should be performed to identify any deficits
- Data used was not current or verified and was not provided with public access in real time. Data was also only obtained for a few sites over a very limited time period and should include data for the White Bay cruise ship terminal

[7] https://www.westconnex.com.au/local-updates?default_view=2&project=14&updates=9

- Permitted emission limits proposed in the EIS for PM_{10}, $PM_{2.5}$, NO_X, NO_2, CO and VOC/THC are too high and are not justified
- The air quality assessment is not evidence based
- The cumulative air quality assessment was inadequate as it includes the Sydney Gateway and Western Harbour Tunnel, both projects are not currently committed to and unlikely to be complete by the time mentioned in the EIS
- Details on the impact of the operational phase of the project on ozone. A submitter requests information about the value of an eight hour standard concentration and goal for ozone in the context of the project
- The cumulative impact assessment did not fully assess cumulative impacts including:
  - Effects of the project occur over a wider area than assessed in the EIS
  - A lack of data on the cumulative impacts on air quality of both the M4 East and M4-M5 Link
  - Does not include the airport and shipping areas and associated pollution in proximity to the project footprint
  - Population growth in the area at Victoria Road to the north of the Iron Cove Link and near Anzac Bridge and Rozelle through *The Bays Precinct Transformation Plan* (UrbanGrowth NSW 2015), are not fully assessed
  - Other existing pollution hotspots
- Air quality data and monitoring sites do not represent all surrounding residential areas including the Anzac Bridge network, St Peters and Kyeemagh
- Assessment does not present accurate worst case and do nothing scenarios leading to a misleading analysis
- Concern over the transparency and public availability of air quality assessment data making it susceptible to data manipulation
- Air quality assessment does not include an adequate assessment of NO_2
- The air quality assessment makes assumptions which are designed to downplay the impacts to air quality.

Response

The EIS included the preparation of a range of comprehensive technical air quality studies including specifically on ventilation facilities (refer to Annexures I to L of Appendix I (Technical working paper: Air quality) of the EIS). These technical studies were prepared in accordance with the key issues identified in the SEARs which included requirements issued by key government regulatory agencies as well as industry standards and guidelines (see **section C9.1.1** for further details).

The EIS, including all detailed technical studies, was reviewed by DP&E to confirm that it adequately addressed the full scope of requirements specified in the SEARs prior to being placed on public exhibition. DP&E also commissioned independent technical peer reviews of key technical studies, including the air quality assessment presented in the EIS, to inform its assessment of the project.

The in-tunnel and ambient air quality assessment was undertaken using criteria, or levels of pollutants, that have been adopted by the NSW Government. SEARs for the project refer to the *Protection of the Environment Operations Act* 1997 (POEO Act) and the Protection of the Environment Operations (Clean Air) Regulation 2010. The project was assessed using the criteria listed in the updated NSW Approved Methods (NSW EPA 2016). Calibrated computer models have been used to predict:

- In-tunnel air quality
- Changes in ambient air quality arising from the project and other planned infrastructure projects, so that changes in local and regional air quality can be assessed.

The design and assessment of the project benefited from data from the design and operation of existing Sydney tunnels. In particular this enabled evidence based calibration of emissions models for both in-tunnel and external emissions modelling.

The air quality assessment considered the potential impacts during construction and operation of the project. The assessment was supported by the project traffic modelling which included predicted land use changes (ie population growth and *The Bays Precinct Transformation Plan*), trip distribution, mode choice and peak and off peak periods (see **section C9.1.3** for further details of traffic modelling). The area covered by the air quality model was 24 square kilometres and included 86,375 discrete receptor locations. The assessment was also supported by long term air quality monitoring from stations across Sydney providing representative ambient air quality for the study area (see **section C9.1.3** for further details of monitoring).

The assessment and the air quality assumptions took a conservative approach which means that a worst case assessment or the highest potential impacts identified are reported. The approach adopted is therefore expected to overestimate potential impacts, not underestimate impacts. Therefore, the calculations presented in Appendix I (Technical working paper: Air quality) of the EIS are considered to be a conservative upper limit estimate.

The do nothing or 'Do Minimum' scenario (ie the 'Without project' scenario), has been considered for the both the 2023 and 2033 modelled years in the assessment. The 'Do something' scenario is the 'with project' scenario and includes the other component projects in the WestConnex program of works, which are either complete or under construction. This scenario therefore presents the cumulative impact assessment for the WestConnex program of works. There is no scenario that only looks at the M4-M5 Link and M4 East project, as the M4 East is assessed as part of the baseline environment. See section C9.20.1 for more information on what the scenarios entail.

Consideration was also given to the potential cumulative impacts of the project with the other component projects of the WestConnex program of works and other major infrastructure projects that are likely to be operational within 10 years of the opening of the project. By including potential projects, a worst case scenario was assessed, even if some future projects are not approved. The assessment included detailed analysis of the predicted air quality inside the mainline tunnels, including entry and exit ramps, during the operation of the project. **Section C26.1.2** describes the activities which could result in cumulative impacts.

Emissions from Sydney Airport, associated flight paths and the White Bay cruise ship terminal are part of the background air quality which is the baseline used for all of the modelled scenarios. Ambient air quality included existing pollutants from industrial, domestic and transportation sources. Annexure B of Appendix I (Technical working paper: Air quality) discusses the pollutant formation, dispersion and transformation processes to provide context for the emissions assessed.

A number of pollutants and metrics were not considered to be relevant to the ambient air quality assessment of the project or to road transport projects in general. Section 9.2.6 of the EIS provides the reasoning behind this. For example, ozone is not assessed for localised air quality because its formation is influenced by several region wide factors unrelated to any one project and cannot practicably be considered in a local air quality assessment.

All relevant air quality monitoring results will be made available to the public on the WestConnex website[8].

C9.7.2 Analysis of particulates not adequately assessed

Submitters expressed concern about the adequacy of the air quality impact assessment relating to particulates during operation. Specific concerns regarding the operation assessment included:

- The air quality analysis fails to take into account fine particulate pollution during operation
- How accurate is the model for Rozelle Public School, as the local Rozelle OEH monitoring station doesn't measure long-term $PM_{2.5}$ with the closest station that does being in Earlwood 10 kilometres away.
- Visibility is not an appropriate measure for particle matter concentration - absolute measures should be used. Submitter would like to see further assessment and calculations including:
  - Concentration of particles in tunnels (averages and maximums)
  - Concentration of particles in the exhaust outlets (averages and maximums)
  - Concentration of particles at various points in the plume

[8] https://www.westconnex.com.au/local-updates?default_view=2&project=14&updates=9

  - Calculations on how dispersion will be affected by winds

- Assumptions on reductions in PM_{10} and $PM_{2.5}$ levels around St Basil's Sister Dorothea Village and Annandale Public School are not clearly stated.

Response

Refer to the responses in **section C9.1.2**.

C9.7.3 Specific queries about the methodology of the air quality assessment related to ventilation facilities

Submitters expressed concern about the methodology and scope of the air quality impact assessment applied for the operation phase of the project. Specific concerns included:

- The amount of detail in relation to the ventilation facilities is minimal
- Did not adequately account for localised impacts on air quality released from the ventilation outlets
- The assessment lacks detail in regards to the potential pollution impacts ventilation facilities may cause to Rozelle Public School
- The assessment did not adequately account for localised impacts on air quality released from the ventilation outlets
- Is the modelling accurate given the complexity of the off-takes, underground linkages, length of tunnels and their large curved nature rather than being a typical single direction
- Requests further details on changes to air quality from the ventilation facilities so residents and experts can provide meaningful comments
- Assessment used a constant temperature in the discharge outlet and therefore does not represent day to day variations
- Cumulative impacts of the facility at Wattle Street not fully assessed
- Concern that the air quality assessment grouped Rozelle ventilation facilities together. The approach to model within 500 metres allows the proponent to downwash the effects in the immediate vicinity of the ventilation facilities
- The air quality assessment does not adequately take into account air quality problems above 10 metres induced by ventilation facilities.

Response

The following annexures of Appendix I (Technical working paper: Air quality) of the EIS provide detailed information and assessment of the ventilation facilities and emissions including dispersion modelling results:

- Annexure I: Ventilation outlet parameters
- Annexure J: Dispersion model evaluation
- Annexure K: All results of dispersion modelling
- Annexure L: Ventilation report.

Specific concerns and responses relating to the assessment methodology of the ventilation outlets assessment are provided in **Table C9-2**.

Table C9-2 Specific concerns relating to the ventilation outlet assessment methodology and responses

Submission concern	Response
The assessment lacks detail in regards to the potential pollution impacts ventilation facilities may cause to Rozelle Public School Did not adequately account for localised impacts on air quality released from the ventilation outlets.	The air quality assessment provides detailed contour plots which map the predicted dispersion of airborne emissions from the ventilation outlets. These maps are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS. The contour plots show annual mean and maximum 24 hour mean concentrations of oxides of nitrogen (NO_X), PM_{10} and $PM_{2.5}$ for the following scenarios for each ventilation outlet: • 2023 'Do something' • 2023 'Do something cumulative' • 2033 'Do something' • 2033 'Do something cumulative'. The modelling indicates a negligible contribution to ground level concentrations of pollutants at Rozelle Public School due to the outlets and an improvement in air quality overall at the school during operation of the project due to a reduction in traffic on Victoria Road, east of Iron Cove Bridge.
Is the modelling accurate given the complexity of the off-takes, underground linkages, length of tunnels and their large curved nature rather than being a typical single direction.	The assessment of in-tunnel air quality used modelling scenarios that reflected the potential modes of operation of the tunnel ventilation system including a worst case scenario. The tunnel ventilation system would be designed with appropriate levels of conservatism and redundancy to ensure compliance with air quality goals and limits. Pollution generated by vehicles travelling in the tunnel is calculated using data and the detailed methodology from "Road tunnels: vehicle emissions and air demand for ventilation" published by PIARC (World Road Association 2012). This international guidance provides emission rates for a range of vehicle types travelling on inclines (and declines). The validation of the emissions model used for the ventilation design is described in *Comparison of PIARC based pollution estimates with measurements in the M5 East tunnel* (Stacey Agnew 2017) which is available on the WestConnex website[9].
Further details requested on changes to air quality from the ventilation facilities so residents and experts can provide meaningful comments.	Contour plots mapping dispersion of emissions for the M4-M5 Link include the contributions from the background, from surface roads and from tunnel ventilation outlets. These maps are provided in section 9.7.3 of the EIS. In addition detailed contour plots are provided which map the predicted dispersion of airborne emissions from just the ventilation outlets. These maps are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS. The changes in air quality both with and without the project during the period from project opening in 2023 to 2033 are driven by changes in the traffic in surface road traffic, not by the very small contribution from the ventilation facilities.

[9] https://www.westconnex.com.au/local-updates?default_view=2&project=14&updates=9

Submission concern	Response
Assessment used a constant temperature in the discharge outlet and therefore does not represent day to day variations.	Sensitivity tests were conducted to investigate the effects of varying the key assumptions in the ambient air quality assessment. These included the influence of ventilation outlet temperature. The ventilation outlet temperatures for the M4 East and New M5 projects were around 25ºC. For this test, the effects of using outlet temperatures 10ºC below, and above, this value were modelled. The results of the tests showed that the predicted concentrations for the ventilation outlets were higher for the lower temperature (by a factor of, on average, around 1.5). The predicted concentrations for both projects remained well below the standards for $PM_{2.5}$, and made up a very small proportion of the total combined results (for surface roads and ventilation outlets). Even with a significant change in ventilation outlet temperature, the total predicted concentration (roads and ventilation outlets) is unlikely to be significantly affected.
Cumulative impacts of the facility at Wattle Street not fully assessed.	The air quality assessment included contour plots showing annual mean and maximum 24 hour mean concentrations of NO_X, PM_{10} and $PM_{2.5}$. This included the following cumulative scenarios for each ventilation outlet including the outlets at the Parramatta Road ventilation facility at Wattle Street: • 2023 'Do something cumulative' • 2033 'Do something cumulative'. These maps are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS.
Concern that the air quality assessment grouped Rozelle ventilation facilities together. The approach to model within 500 metres allows the proponent to downwash the effects in the immediate vicinity of the ventilation facilities.	Each outlet was entered into the air quality model separately, reflecting the design and the emissions from each facility. For example, emissions from outlets H, I and J at Rozelle, were modelled individually. The results for each individual outlet are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS. Contour plots show the results for all tunnel ventilation outlets across the whole domain combined. For any given receptor location, the 'outlet' contribution is from every ventilation outlet in the whole domain. The dispersion model included terrain data for Sydney obtained from the ASTER website and was based on 30 metre resolution data. This was the resolution used for the dispersion modelling, not 500 metres. Building downwash effects were modelled in the sensitivity testing undertaken (see **section B1.1.4)**.

Submission concern	Response
The air quality assessment does not adequately take into account air quality problems above 10 metres induced by ventilation facilities.	An assessment was undertaken to determine the air quality impacts of the project on elevated receptors (elevated by buildings and terrain) (refer to section 9.7.5 of the EIS). The air quality assessment modelled pollution dispersion taking into account local terrain and topography, including the presence of buildings in urban areas. Concentrations at two elevated receptor heights (10 metres and 30 metres) were considered for annual mean and 24 hour $PM_{2.5}$. It should be noted that, at the 10 metre and 30 metre heights, it was not necessarily the case that there were existing buildings at these heights at sensitive receptor locations. The intent of the elevated receptor analysis was twofold: • To determine potential adverse air quality impacts on existing elevated receptors • To identify if there are potential constraints that should be taken into account for potential future developments, and which should be addressed through planning controls.

C9.7.4 Specific queries relating to the air quality assessment policy and international standards used for the assessment

Submitters queried the policies and standards referred to in the air quality assessment methodology. Specific concerns included:

- NSW standards for air quality are below international standards
- Traditionally state, national and international guidelines and criteria for safe levels of air quality has lowered as the knowledge of impacts of pollutants has improved. The EIS predicts air quality under current criteria to be modest, which one day in the future may be seen as unhealthy levels
- The assessment assumes that the current national criteria are actually safe for human health. There is no safe level of particulate matter as one particle may be carcinogenic.
- Request for provision of modelling data on the number of hours per day and per year when air quality will exceed WHO criteria. This means giving an account of the number of hours that air quality for fine particles ($PM_{2.5}$), is above 8 µg/m^3
- NEPM criteria derived through an agreement between the state and federal government rather than scientific evidence
- Commonly employed air quality approaches are biased towards compliance with national environment protection measures
- The prospects of future improvements in vehicular emissions and usage of electric vehicles are not realistic as there has been no policy framework or infrastructure planned for it.

Response

Specific queries and responses relating to the policies and standards referred to in the air quality assessment methodology are provided in **Table C9-3**.

Table C9-3 Specific queries relating to policy and international standards used for the assessment

Submission concern	Response
NSW standards for air quality are below international standards.	Applicable air quality standards in NSW are set by the NSW EPA, having regard to national and international practice, and taking into account local conditions and regulatory requirements. A review of international health-related ambient air quality standards (section 9.2.3 of the EIS) shows that the annual mean $PM_{2.5}$ of 8 µg/m^3 is one of the most stringent standard in the world, including the WHO standard, and the 24 hour mean $PM_{2.5}$ of 25 µg/m^3 is equal to the lowest international standards. The only particulate standard that is not equal to or lower than any other standard in the world is the current NSW Approved Methods assessment criteria for annual mean PM_{10} standard of 30 µg/m^3 and, although the European Union and the United Kingdom have a higher criterion of 40 µg/m^3, the lowest or most stringent standard for annual mean PM_{10} in the world is Scotland with a criterion of 18 µg/m^3, noting that Scotland has a low background level of particulate matter and this is a realistic standard in that context.
State, national and international guidelines and criteria for safe levels of air quality has lowered as the knowledge of impacts of pollutants has improved. The EIS predicts air quality under current criteria to be modest, which one day in the future may be seen as unhealthy levels.	The project was assessed using current air quality criteria listed in the updated NSW Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA 2016) (refer to section 4.6.1 of Appendix I (Technical working paper: Air quality) of the EIS) which the adopted AAQNEPM standards that were updated in 2016. The national standards were developed to provide 'adequate protection of human health and wellbeing'. Regulators ensure air quality criteria are based on the best current knowledge and criteria, are set to protect the health of populations and are relevant to the local environment and background levels. Refer to Chapter 11 (Human health risk) of the EIS.
The assessment assumes that the current national criteria are actually safe for human health. There is no safe level of particulate matter as one particle may be carcinogenic.	The project was assessed against current air quality criteria that was based on the national standards developed to provide adequate protection of human health and wellbeing. Regulators ensure air quality criteria are based on the best current knowledge, are set to protect the health of populations and are relevant to the local environment and background levels. In addition to an assessment against the standards, the health consequences of the changes in air quality due to the project were assessed. Refer to Chapter 11 (Human health risk) of the EIS.

Submission concern	Response
Request for provision of modelling data on the number of hours per day and per year when air quality will exceed WHO criteria. This means giving an account of the number of hours that air quality for fine particles $PM_{2.5}$, is above 8 µg/m^3	Applicable air quality standards in NSW are set by the NSW EPA, having regard to national and international practice. Exceedances are reported against the criteria thresholds set by the NSW EPA for NSW. The NSW annual average standard for $PM_{2.5}$ is however, numerically lower than the WHO standard. Therefore any reported exceedance would also relate to the WHO standard. However, the air quality criteria for $PM_{2.5}$ are for an annual mean, not hourly, and so it is not possible to predict an hourly exceedance of the an annual mean. As the background concentration was taken to be the same as the NSW criterion of 8 µg/m^3, the total concentration at all receptors was above this value. The highest concentration at any receptor was 14.2 µg/m^3 but, as with other pollutants and metrics, high values were only predicted for a small proportion of receptors and are unlikely to reflect real-world exposure situations. In the 'with project' scenarios, the largest surface road contribution at any receptor was 5.4 µg/m^3. The largest contribution from tunnel ventilation outlets in these scenarios was 0.17 µg/m^3.
NEPM criteria derived through an agreement between the state and federal government rather than scientific evidence.	Between 2012 and 2015, the NSW EPA led a review of the Ambient Air Quality NEPM. This review was undertaken by scientists and based upon scientific evidence. The result was the adoption of one of the most stringent national standards for fine particles in the world.
Commonly employed air quality approaches are biased towards compliance with national environment protection measures.	Assessment criteria and conditions of approval are based on NSW EPA air quality criteria (refer to Table 9-2 of the EIS) and the health consequences of the changes in air quality due to the project (refer to Chapter 11 (Human health risk) of the EIS).
The prospects of future improvements in vehicular emissions and usage of electric vehicles are not realistic as there has been no policy framework or infrastructure planned for it.	Future reductions in emissions are based on current standards only. The EIS does not consider any reductions in addition to this that will be achieved by either tighter future standards, or the uptake of electric vehicles.

C9.7.5 Specific queries relating to the type and accuracy of data used in the operational air quality assessment

Submitters expressed concern about the methodology and scope of the air quality impact assessment applied for the operation phase of the project. Specific concerns included:

- The air quality assessment is based on unreliable traffic projections of traffic volumes and driving conditions. It does not account for stop-start traffic scenarios, specifically at the Rozelle interchange, given it has:
  - Steep and long climbs
  - Traffic moving onto Anzac Bridge currently operates on the lowest level of service (LoS F) in peak times
  - Significant queues are expected on entering the tunnels
- Insufficient data was used in the air quality assessment relating to additional traffic volume from the project
- Health authorities need to keep reducing air quality criteria to ensure vehicle emissions reduce to be compliant

- The dependency of the air quality assessment on traffic predictions. If the traffic analysis is wrong then so is the air quality analysis. In a detailed report from Citi analysts, traffic predictions that have been calculated for 2031 are unlikely to be achievable
- Air quality modelling does not reflect the stationary traffic at Iron Cove Bridge, likely to be caused where the lanes merge, heading north on Victoria Road
- Air quality modelling does not use the M4-M5 link monitoring stations as there was no data for 2015. $PM_{2.5}$ was not assessed at all which does not provide detailed background concentrations
- Data was not obtained from a National Association of Testing Authorities (NATA) accredited operator
- Data is not the same standard as obtained by OEH
- Predicted cumulative values are unreliable given that there is no existing NO_X data for ambient conditions at Annandale/Rozelle
- $PM_{2.5}$ is presented as historical criteria rather than long term criteria with no justification for predicted reductions
- Appropriate mass discharge limits were not assessed
- Air quality modelling does not assess the impacts of a toll on the Iron Cove Link
- The EIS claims in Table 5.3 that the NO_2 criteria for one hour are 246 g/m^3. Apart from being wrong, the criterion is 1,000 times greater than that used by the NSW EPA
- Inadequacy of in-tunnel air quality modelling as the model used is for straight, short distance tunnels and not for corners
- Air quality modelling does not include future forecast reductions in emissions criteria
- The air quality assessment is not adequate during the morning peak hour when the most emissions would be produced and the prevailing wind direction is towards Rozelle Public School.

Response

Specific concerns and responses relating to the methodology of the air quality assessment are provided in **Table C9-4**.

Table C9-4 Specific concerns and response relating to the methodology of the air quality assessment

Submission concern	Response
Air quality assessment is based on unreliable traffic projections of traffic volumes and driving conditions. It does not account for stop-start traffic scenarios, specifically at the Rozelle interchange given it has: • Has steep and long climbs • Traffic moving onto Anzac Bridge currently operates on the lowest level of service (LoS F) in peak times • Significant queues are expected on entering the tunnels	The EIS includes detailed analysis of the predicted air quality inside the mainline tunnels, including entry and exit ramps, during the operation of the project. The air quality assessment, supported by the 24 hour traffic modelling presented in Chapter 8 (Traffic and transport) of the EIS, included existing baseline information such as traffic flows over Anzac Bridge. Emissions modelling has been calculated factoring in the length of each section of the project, the time taken for vehicles in the tunnel to pass through each section, slow moving/congested traffic , the number of vehicles in the tunnel and the respective gradients of the tunnels and ramps. This means that the individual design characteristics of each intersection such as the Rozelle interchange has been accounted for in the traffic modelling and therefore the air quality assessment.

Submission concern	Response
Insufficient data was used in the air quality assessment relating to additional traffic volume from the project	The air quality assessment was supported by the traffic assessment presented in Chapter 8 (Traffic and transport) of the EIS and the volumes and movements of traffic predicted through traffic modelling. The key strategic transport planning model used in the Sydney greater metropolitan area is the Strategic Traffic Model (STM), which is managed by Transport for NSW Transport Performance and Analytics. The STM is used as the basis for the project traffic modelling and includes the capability to address future changes in trip distribution and mode choice as well as producing vehicle traffic demand during peak and off peak periods. The STM was used as the basis for developing the WRTM which predicts the future growth in road traffic demands for a more detailed transport and pricing scenario traffic model for the project.
Health authorities need to keep reducing air quality criteria to ensure vehicle emissions reduce to be compliant	It has been shown that control of pollutants at the source, ie vehicle emissions controls, is significantly more effective in improving local and regional air quality (Advisory Committee on Tunnel Air Quality (ACTAQ) 2014, National Health and Medical Research Council (NHMRC) (2008)). The NSW Government is committed to continuing to work with the Australian Government to implement more stringent standards for passenger cars and heavy vehicles to ensure cleaner fuels and cleaner vehicles, hence reducing emissions at source. Total emissions from the Sydney vehicle fleet have reduced over the last 20 years and are projected to continue to reduce into the future. In addition, all new vehicles in Australia are imported and most would be manufactured to the higher European standards.
The dependency of the air quality assessment on traffic predictions. If the traffic analysis is wrong than so is the air quality analysis. In a detailed report from Citi analysts, traffic predictions that have been calculated for 2031 are unlikely to be achievable	The Citi analysts predict 10 per cent less traffic than was forecast in the project traffic assessment. For the project, traffic analysis was based on latest version of the WestConnex Road Traffic Model (ie WRTM v2.3) which is the best forecast model available for the proposed operational years. The Citi analysts model appears to be a different model with analysis completed for a different purpose, not for environmental impact assessment. In comparison to the Citi model, the WRTM is more conservative with respect to environmental impacts. This means that if the Citi model predictions are shown to be more accurate in the future then the environmental impacts would be less than presented in the EIS.
Air quality modelling does not reflect the stationary traffic at Iron Cove Bridge likely to be caused from where lanes merge heading north on Victoria Road	The air quality assessment supported by the traffic modelling for the project presented in Chapter 8 (Traffic and transport) the EIS, included existing baseline information such as traffic flows at Iron Cove Bridge. The air quality assessment included detailed analysis of the predicted air quality from traffic during the operation of the project including from the surface road traffic on Victoria Road at Iron Cove. Contour plots were developed to illustrate the spatial distribution of pollutant concentrations, from all sources including surface roads. The contour plots showing the change in pollutants as a result of the project in 2023 and 2033 were shown in Chapter 9 of the EIS (Refer to Figure 9-31 and Figure 9-37 for example). The contour plots for all other scenarios are given in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS.

Submission concern	Response
Air quality modelling does not use the M4-M5 link monitoring stations as there was no data for 2015 and $PM_{2.5}$ was not assessed at all which does not provide detailed background concentrations	Several monitoring stations in the study area were used to determine appropriate background levels for the air quality dispersion modelling (see **section C9.1.3**). Additional stations for the M4-M5 project were established in April 2016 (see **Table C9-1**). As the study year was 2015, data from these stations were not able to be included in the assessment. These stations were installed to establish a baseline against which the post opening performance of the project can be measured. The locations of air quality monitoring stations used in the modelling provided representative roadside or background data suitable for the project area, including particulate matter.
Data was not obtained from a NATA accredited operator. Data is not the same standard as obtained by OEH	The monitoring stations from which the data was obtained are managed by OEH and Roads and Maritime. OEH and Roads and Maritime sites are consistently managed across Sydney. Analysis of data is consistent with NATA standards. Section 9.5.7 of the EIS lists the monitoring sites in the air quality assessment study area and section 9.5.8 describes the project specific air quality monitoring.
Predicted cumulative values are unreliable given that there is no existing NO_X data for ambient conditions at Annandale/Rozelle	Background concentrations for 2015 were developed using monitoring data from the OEH monitoring stations at Chullora, Earlwood, Randwick and Rozelle sites, the Roads and Maritime M5 East background sites, and the M4 East St Lukes Park site (see **section C9.1.3** for further details of monitoring). These monitoring stations provide representative data for the air quality in the study area. Existing background data was collected for CO, NO_X, PM_{10} and $PM_{2.5}$. This data was used to develop the base year (2015) scenario which supported the future year predictions of air quality.
$PM_{2.5}$ is presented as historical criteria rather than long term criteria with no justification for predicted reductions	Monitoring data is by its nature historical. The NSW EPA assessment criteria is for annual mean and 24 hour mean concentrations. The AAQNEPM was amended in February 2016 relating to particulate matter. One of the main changes being an aim to move to annual average $PM_{2.5}$ to seven µg/m^3 and the 24 hour $PM_{2.5}$ standard to 20 µg/m^3 by 2025 (NEPC 2016).
Appropriate mass discharge limits were not assessed	Mass discharge limits were assessed. Mass discharge was set for each ventilation outlet and is used for the basis of the ambient air quality modelling. Refer to section 9.7 of the EIS.
Air quality modelling does not assess the impacts of a toll on the Iron Cove Link	The Iron Cove Link component of the M4-M5 Link project will not be tolled. This commitment was made by the NSW Government when the Iron Cove Link was announced in July 2016.
The EIS claims in Table 5.3 that the NO_2 criteria for one hour are 246 g/m^3. Apart from being wrong, the criterion is 1,000 times greater than that used by the NSW EPA	The statement in the submission is incorrect. The NO_2 criteria for one hour presented in both Table 5.3 of Appendix I (Technical working paper: Air quality) and Table 9-2 of the EIS is stated correctly as 246 µg/m^3.

Submission concern	Response
Inadequacy of in-tunnel air quality modelling as the model used is for straight, short distance tunnels and not for corners	The in-tunnel modelling was reviewed by international independent peer reviewers engaged by ACTAQ, who found that "*We find that the assessment methodology is sound and represents best practice. All of the models and data used are appropriate and expertly used*" (see **section B3.2.2**) The total tunnel emissions were calculated based on the sum of each tunnel section's emissions, factoring in the length of each section, the time taken for vehicles in the tunnel to pass through each section, the number and type of vehicles in the tunnel and the respective gradients. The modelling accounted for both long tunnel stretches and the curved alignment of the tunnels.
Air quality modelling does not include future forecast reductions in emissions criteria	The project was assessed using current air quality criteria listed in the updated NSW Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA 2016) which adopted AAQNEPM standards that were updated in 2016. The national standards were developed to provide 'adequate protection of human health and wellbeing'. Regulators ensure air quality criteria are based on best current knowledge, are set to protect the health of populations and are relevant to the local environment and background levels.
Air quality assessment is not adequate during the morning peak hour when the most emissions would be produced and the prevailing wind direction is towards Rozelle Public School	As part of the air quality impact assessment, likely worst case scenarios were taken into account by using a sophisticated meteorological and dispersion model utilising a full year of meteorological data. This included assessment of localised accumulation of pollutants under low wind speeds. Meteorological information including wind direction, wind speed, calms/low wind speed conditions, and temperature inversions, were used to model the peak concentration of air pollutants that may occur. The air quality assessment provided contour plots mapping dispersion of emissions for the M4-M5 Link. These maps are provided in section 9.7.3 of the EIS. Rozelle Public School was individually assessed in the M4-M5 Link EIS as Community Receptor 31 (CR31). The effects of terrain and relative heights are taken into account in the dispersion modelling.

C9.8 General air quality concerns during operation

148 submitters raised concerns about impacts to air quality. Refer to section 9.7 and Appendix I (Technical working paper: Air quality) of the EIS for details of potential air quality impacts during operation.

C9.8.1 General air quality concerns during operation of the project (general/non-specific)

Submitters expressed concerns regarding air quality impacts from the project and that the project would increase air pollution. Specific concerns and queries raised included:

- Air quality impacting the community as a result of the project specifically at schools and day care centres, areas of traffic congestion and families and businesses
- The tunnels will not improve the ambient levels of volatile organic compounds or polycyclic aromatic hydrocarbon emissions
- Elevated levels of $PM_{2.5}$ and PM_{10} when they are already near or in excess of the air quality health guidelines

- Any reduction in CO_2 emissions made by an individual vehicle will be offset by increased emissions while stuck in increased traffic at either end of the new roads
- Experts external to the project claiming that Rozelle will have the worst air quality in the Sydney Basin
- Increased air pollution will decrease the effectiveness of solar panels.
- Promotion of car use resulting in increased emissions from the project
- Impact of ozone emitted from the project on western Sydney
- The impacts to air quality due to grades of over four per cent resulting in increased emissions and congestion
- The community around St Peters have to deal with exhaust from tunnels and additional car emissions from the added traffic during operation
- Car emissions are bad for the environment.

Response

As the larger part of the project alignment would be underground, the operation of the project is predicted to result in an overall decrease in total pollutant levels in the community. There would be a redistribution of vehicle emissions (including PM, CO, VOCs and PAHs associated with redistribution of the traffic on surface roads). For much of the community this would result in no change or a small improvement such as decreased concentrations, reduction in deposition of particulate matter (which may settle on solar panels) and health impacts. These improvements would occur across all areas impacted by the project, including Rozelle. However, for some areas located near key surface roads, a small increase in pollutant concentration may occur. Ground level ozone caused from vehicle emissions could impact regional air quality and result in hazes. Predicted incremental increases in ozone concentration due to the project is below the screening impact level of 0.5 parts per billion. Overall, it is concluded that the regional impacts of the project would be negligible, and undetectable in ambient air quality measurements at background locations (refer to section 9.8 of the EIS).

The predicted changes in pollutant concentrations were as a result of changes in the traffic volumes on the surface roads, not due to the tunnel ventilation outlets. The project ventilation system has been designed and would be operated so that it will achieve some of the most stringent standards in the world for in-tunnel air quality, and will be effective at maintaining local air quality. The design of the ventilation system will also ensure no portal emissions.

For the expected traffic scenarios, the contribution of tunnel ventilation outlets to ground level concentrations for all pollutants was negligible. This is due to the effective dispersion that occurs when tunnel emissions are discharged at height and at velocity into the atmosphere. For some air quality metrics (one hour NO_2 and 24 hour PM_{10} and $PM_{2.5}$), exceedances of the criteria were predicted to occur both with and without the project. However, where this was the case the total numbers of receptors with exceedances were predicted in the air quality modelling to decrease slightly with the project and in the cumulative scenarios.

For $PM_{10,}$ background levels are already at or slightly above the criterion for both the annual and 24 hour means. Therefore PM_{10} exceedances of the NSW annual mean criterion (25 µg/m^3) are predicted to occur both with and without the project. Due to the reduction in surface traffic as a result of the project, the number of receptors with exceedances of the criteria is predicted to decrease slightly.

In the case of $PM_{2.5}$, the background levels are at or slightly above the criterion for both the annual and 24 hour means. Therefore $PM_{2.5}$ exceedances of the NSW annual mean criterion (8 µg/m^3) are predicted to occur both with and without the project. In many locations there is a decrease with the project because of the reduction in surface road traffic. Where increases in pollutant concentrations were predicted, these were mostly small. The spatial changes in local air quality as a result of the project reflect the changes in traffic on the surface road network. For example:

- Marked reductions in pollutant concentration were predicted along Dobroyd Parade/City West Link and Parramatta Road to the southeast of the Parramatta Road ventilation facility at Haberfield. In the 2023 'Do Minimum' scenario, the traffic to and from the M4 East tunnel would access the tunnel using these roads. In the 'with project' scenarios the M4-M5 Link tunnel connects to the M4 East tunnel, reducing emissions of pollutants from those surface roads

- A substantial reduction in pollutant concentrations was predicted along the Victoria Road corridor south of Iron Cove at Rozelle, due to surface traffic being diverted through the Iron Cove Link tunnel
- There would also be reductions in pollutant concentrations along General Holmes Drive, Princes Highway and the M5 East Motorway
- However, there would be additional traffic (and an increase in pollutant concentrations) on Victoria Road to the north of Iron Cove Link and near Anzac Bridge as a result of the general increase in traffic due to the project
- Pollutant concentrations were also predicted to increase along Canal Road, which would be used to access the St Peters interchange, and other roads associated with the proposed future Sydney Gateway project, as it is expected to be a surface road
- Air quality during peak periods is worse than non-peak periods because there is more traffic during peak periods. The in-tunnel ventilation system will keep the air quality within the tunnel within allowable limits at all times.

Entry and exit ramps would vary in size and shape in response to local conditions, but all are designed to minimise gradient changes and congestion at the project portals both when vehicles are entering and exiting the tunnels. This would therefore minimise vehicles emissions being concentrated near tunnel ramps at either end of the project.

Maximum limits on gradients of less than four per cent have generally been adopted in the mainline tunnel design as identified in section 5.3.6 of the EIS. However, there are some isolated locations, such as at the Rozelle and St Peters interchanges and the Wattle Street off ramp, where there are localised constraints, such as existing surface road or direct impacts on properties, to ensure appropriate ground condition gradients of greater than four per cent have been adopted. The detailed design process would seek to optimise grades to ensure tunnels have longer, flatter sections to achieve optimal ventilation and heavy vehicle performance, thereby reducing emissions.

C9.8.2 Removal of trees reducing air quality

Submitters raised concerns that the removal of trees would exacerbate air pollution caused by an increase in traffic. Specific concerns included:

- Trees offer protection against all the extra air pollution
- Trees planted in conjunction with this project should be native evergreen trees with dense canopies as deciduous trees would not filter the air pollutants for half the year
- Trees act as air filters as well as visual screening
- Trees should be used to absorb air pollution however parks should not be near ventilation shafts or portals.

Response

See the response in **section C9.6.1** regarding the effectiveness of vegetation for filtration of air pollutants.

As the larger part of the project alignment would be underground, the operation of the project is predicted to result in a decrease in total pollutant levels in the community and therefore at local public open spaces. The proposed open space at the Rozelle Rail Yards would provide the community with a large area of open space and active transport links away from main roads.

C9.9 Operational air quality of tunnel portals

385 submitters raised concerns about impacts to air quality at the tunnel portals. Refer to section 9.7 and Appendix I (Technical working paper: Air quality) of the EIS for details of in-tunnel air quality during operation.

C9.9.1 Impacts on air quality at tunnel portals during operation

Submitters raised concern about air quality impacts from the tunnel portals. Submitters were particularly concerned with the following:

- No provision has been made to deal with the concentration of emissions around the tunnel exits
- How will zero portal emissions be achieved under all conditions
- That motorists who open their windows just after exiting the tunnels will be exposed to emissions above levels recommended in NSW
- That the M4-M5 Link would add to the deteriorating air quality through traffic congestion at the tunnel portals
- The concentration of carbon dioxide and lead coming from the volume of vehicles through the tunnel entrance and exit
- That the increased gradients at the tunnel portals will result in an increase in vehicle emissions
- Air quality impacts at the proposed recreational area at the Rozelle Rail Yards
- Pollutants from traffic surfacing at the tunnel portals in the vicinity of Wattle Street, Parramatta Road, Victoria Road and near Rozelle School
- Air quality impacts at residential properties, schools and sports fields resulting from large volumes of vehicles accelerating and decelerating as they enter and exit the tunnel portals.

Response

A key operating restriction for tunnels in Sydney is the requirement for there to be no emissions of air pollutants from the portals. Emissions from vehicles assessed within the EIS included CO, NO_X, PM_{10} and $PM_{2.5}$ and hydrocarbons. To avoid portal emissions, the ventilation system would be designed to ensure that polluted air would be expelled from one or more elevated ventilation outlets along its length. The air from exit ramps is pushed back to the ventilation outlets by tunnel ventilation fans to prevent emissions from the portals.

Velocity monitors will be placed in each tunnel ventilation section and at portal entry and exit points. The velocity monitors in combination with air quality monitors will be used to control the ventilation fans within the tunnel to manage air quality and to ensure air inflow at all tunnel portals (refer to **Chapter E1** (Environmental management measures)).

There are some circumstances when portal emissions may be permitted, such as emergency situations and during major maintenance periods, which would be undertaken during night-time tunnel closures as is current practice in Sydney tunnels.

Entry and exit ramps would vary in size and shape in response to local conditions, but all are designed to minimise gradient changes and congestion at the portals both when vehicles are entering and exiting the tunnels, thereby minimising emissions collecting near tunnel ramps. The ventilation systems would be designed for the specific tunnel and road geometry and associated emissions.

Much of the community, including residences, community facilities and areas of open space, would experience no change or a small improvement in air quality as a result of the project through a reduction in surface road traffic (see **section C9.8.1** for further detail).

Lead (Pb) was not considered to be relevant to the ambient air quality assessment of the project (nor to road transport projects in general) as the removal of lead from petrol means that it is no longer considered to be an air quality consideration in ambient air quality.

C9.10 In-tunnel air quality during operation

127 submitters raised concerns about in-tunnel air quality. Refer to section 9.7 and Appendix I (Technical working paper: Air quality) of the EIS for details of in-tunnel air quality.

C9.10.1 Questions regarding the treatment of air within the tunnels

Submitters raised issues around the air quality within the tunnels. Specific queries relate to:

- Concern that the pollution expulsion method proposed will not adequately expel polluted air and that this method can only be used for straight tunnels of short distances

- Concern about the tunnel ventilation system. Submitter believes it is very difficult to achieve clean air in any tunnel. There will be periods of congestion where motorists in the tunnel will be exposed to additional pollutants for longer periods of time
- Request for further assessment of in-tunnel emissions in regards to motorist exposure during congestion, regular driver exposure, exposure during a fire or other emergency situation.
- Concern about how air quality will be treated within the deepest tunnel under Rozelle and Lilyfield specifically
- Proposal is at concept phase and in-tunnel air quality standards are not guaranteed
- Concern that there is no exhaust system from the tunnels between St Peters and Haberfield
- Filtration technology should be installed for in-tunnel pollution in a similar manner to other premises emitting a significant quantity of air pollution.

Response

Tunnel infrastructure would be designed in such a way that the generation of pollutant emissions by the traffic using the tunnel is minimised. The main considerations are minimising gradients and ensuring that lane capacity remains constant or increases from entry to exit point. Traffic management would also be used to improve traffic flows, which would result in reduced overall emissions.

The project ventilation system has been designed and would be operated so that it will achieve some of the most stringent standards in the world for in-tunnel air quality, and will be effective at maintaining local air quality. The project would include longitudinally ventilated tunnels, which rely on the movement of air through the tunnels in the same direction as the flow of traffic. Air moves continuously from the tunnel entry portals towards ventilation facilities located near the tunnel exit portals, before it is emitted through elevated outlets. The ventilation system includes tunnel ventilation fans throughout the tunnels to assist in moving air through the tunnel as needed and allows for bends, long stretches of tunnels and the proposed depth of the tunnels at all points. The air from exit ramps is also pushed back to the ventilation outlets by tunnel ventilation fans to prevent emissions from the portals. The ventilation system has also been designed to account for congestion and emergency situations (see **section C9.10.2** for further details).

The Campbell Road ventilation facility at St Peters would extract exhaust from the southbound M4-M5 Link mainline tunnel and the southbound St Peters exit ramp. The ventilation facility at Rozelle would extract exhaust from the northbound mainline tunnels. This includes the tunnels between St Peters and Haberfield. Filtration technology is discussed in **section C9.11.1**. The findings made by ACTAQ on the ventilation report (Annexure I of Appendix I (Technical working paper: Air quality) of the EIS) were:

'The M4-M5 Link ventilation report is a very ambitious, comprehensive and detailed report, successfully serving its purpose of assessing both in-tunnel air quality and emissions to surrounding environments for further dispersion calculations.' (see responses in **section B3.2.4** for further details).

'We are satisfied that the EIS has comprehensively addressed the issue of cumulative exposure arising from journeys through multiple consecutive tunnels made possible by the M4-M5 Link.' (See responses in **section B3.2.5**).

The tunnel ventilation system would be designed and operated so that the in-tunnel air quality limits, consistent with those in the conditions of approval for NorthConnex and the approved WestConnex projects, are not exceeded for any journey through the M4-M5 Link and adjoining tunnels, no matter how long the journey. Key features of the tunnel design include:

- The total tunnel emissions were calculated based on the sum of each tunnel section's emissions, factoring in the length of each section, the time taken for vehicles in the tunnel to pass through each section, the density of vehicles in the tunnel and the respective gradients
- The tunnel ventilation system would be designed with appropriate levels of conservatism and redundancy to ensure compliance with air quality goals and limits. There is no in-tunnel filtration system proposed as the modelling undertaken demonstrates that the ventilation system would be effective in ensuring compliance with the in-tunnel air quality criteria

- If in-tunnel air quality levels could not be achieved with the ventilation system proposed, the most effective solution would be the introduction of additional ventilation outlets and additional locations for fresh air supply. The inclusion of tunnel filtration was evaluated and found not to provide any material benefit to air quality or community health.

While concentrations of pollutants from vehicle emissions may be higher within the tunnel (compared with outside the tunnel) the time spent exposed to these pollutants is relatively short (minutes). Where health based guidelines are available, exposures within the tunnel are predicted to be below these guidelines.

Drivers who regularly use tunnels or drive in congested traffic in Sydney can minimise exposure to vehicle emissions by keeping windows up and air conditioning on recirculation when in tunnels or heavy traffic conditions. Keeping windows closed and switching ventilation to recirculation has been shown to reduce exposures inside the vehicle by up to 80 per cent.

Velocity monitors will be placed in each tunnel ventilation section and at portal entry and exit points. The velocity monitors in combination with air quality monitors will be used to control the ventilation fans within the tunnel to manage air quality and to ensure air inflow at all tunnel portals (see **Chapter E1** (Environmental management measures)).

The concept design would be refined during detailed design, however, the design presented by the contractor will need to satisfy all technical road design requirements based on the project and road functionality as described in the EIS. It will also need to be consistent with the approved scope of the project, including the environmental management measures and conditions of approval for the project.

C9.10.2 Worst case air quality scenarios

Submitters raised concerns regarding the predicted impacts to receptors from air quality impacts during worst case scenarios of tunnel operation. Specifically submitters were concerned with air quality in tunnels at the Rozelle interchange in the event of a traffic incident or fire.

Response

One of the modelling scenarios of the air quality assessment was a regulatory worst case scenario. The objective of this scenario was to demonstrate that compliance with the concentration limits for the tunnel ventilation outlets would deliver acceptable ambient air quality to the surrounding receptors. The scenarios assessed emissions from the ventilation outlets only. This represented the theoretical maximum changes in air quality for all potential traffic operations in the tunnel, including unconstrained and worst case traffic conditions from an emissions perspective, as well as vehicle breakdown situations. The results of this analysis demonstrated the air quality performance of the project if it operates continuously in the worst operating conditions. In reality, ventilation outlet concentrations would vary over a daily cycle due to changing traffic volumes and tunnel fan operation. This assessment is therefore very conservative, and results in emission contributions from project ventilation outlets that would be much higher than those that could occur under usual operational conditions in the tunnel but still within the ambient air quality limits.

In the case of a fire, ventilation fans would be used to propel the smoke downstream to the nearest ventilation outlet, or tunnel portal(s), depending on the location of the fire. This would prevent smoke flowing backwards from the fire source over any vehicles that are stationary behind the fire. The ventilation system, combined with the deluge system, would be able to control the heat and smoke in the tunnel so as to maintain a usable air supply permitting safe evacuation of occupants, and to provide the emergency services with a safe route to deal with the fire and to rescue any trapped or injured persons. Details on the emergency access routes and smoke control system are provided in section 5.8.3 of the EIS. The results of the regulatory worst case scenario on surrounding receptors were:

- The predicted maximum one hour NO_2 concentrations were very high at some receptors. These receptors were mostly in the vicinity of Anzac Bridge, especially at the western end, with a small number alongside King Georges Road and there were also two receptors in the area of Sydney Airport. None of the receptors were especially sensitive in nature, being either ‘industrial’, ‘commercial’ or ‘other’, and most of the highest values occurred in 2023
- 38 receptors had predicted increases in annual mean $PM_{2.5}$ that were more than 10 per cent of the air quality criterion (ie greater than 0.8 µg/m^3), and one receptor (commercial) had a predicted increase that was above the project specific health risk criterion of 1.8 µg/m^3 (refer to Appendix K (Technical working paper: Human health risk assessment) of the EIS). The affected receptors

were in two areas: around Anzac Bridge, and around St Peters. The modelling indicates that the affected receptors in the St Peters area were impacted by the proposed future Sydney Gateway project. The alignment of the Sydney Gateway used in this assessment is indicative only and further assessment of these receptors would be undertaken in the Sydney Gateway EIS

- For both NO_2 and $PM_{2.5}$, it is unlikely that these extreme results are realistic, due to the unlikely event of a continuous worst case scenario and potential over estimation of traffic volumes.

A key operating restriction for long road tunnels in Sydney is the requirement for there to be no emissions of air pollutants from the portals. To avoid portal emissions the polluted air from within a tunnel must be expelled from one or more elevated ventilation outlets along its length. There are some circumstances when portal emissions may be permitted, such as emergency situations. Emergency situations by their nature would extend for very short durations and would not impact surrounding areas long term.

It can be concluded that emissions from the project ventilation outlets, even in the regulatory worst case scenarios of traffic congestion (excluding temporary emergency situations such as a fire), would be unlikely to result in significant changes to local air quality. Roads and Maritime will conduct ambient air quality monitoring after the motorway is opened and the results would be made publicly available (see **section C9.18.1** for further details on air quality monitoring).

C9.11 Operational air quality impacts of ventilation facilities – general

1,027 submitters raised concerns about impacts to air quality from the unspecific ventilation facilities. Refer to section 9.7 and Appendix I (Technical working paper: Air quality) of the EIS for details of air quality assessment findings.

C9.11.1 Impacts of unfiltered nature of the ventilation outlets

Submitters raised the concern that the lack of filtration of the emissions from the ventilation outlets is irresponsible, poses an unacceptable health risk and is not ‘best practice'. Specifically, concerns were raised regarding:

- Assertion that air filtration won’t make a measurable improvements to air quality does not come with supporting data
- Impacts of unfiltered ventilation facilities, particularly in regards to $PM_{2.5}$ pollutants, diesel emissions and will increase toxic fine particle pollution
- The unfiltered nature of the ventilation facilities near sensitive receivers including schools, open spaces and populated streets and highly populated suburbs (at Haberfield, Rozelle, Iron Cove, St Peters, Birchgrove)
- Rozelle will be subject to unfiltered smoke outlets, specifically with four unfiltered ventilation facilities proposed
- Why it would be too expensive to filter the ventilation outlets considering the total cost of the project
- The EIS stated that ‘if in-tunnel air quality was not achieved with the ventilation system, the most effective solution would be the introduction of additional ventilation outlets and additional locations for fresh air supply’. This suggests that filtering the ventilation outlets would be a more appropriate solution
- Approval should be delayed until the upcoming Roads and Maritime policy review on filtration of ventilation outlets has been made available for public comment
- The impact of unfiltered emissions from ventilation outlets in the event of light winds and temperature inversion
- Unfiltered ventilation facilities being located under the Sydney Airport flight path.

Response

The assessment of the need for filtration determined that there was no beneficial impact on air quality by implementing tunnel air filtration (refer to section 9.2.3 of the EIS). The assessment demonstrated that any predicted impact on local air quality due to emissions from the ventilation outlets would be very small. Specifically the following:

- Under expected traffic conditions, the predicted contribution of tunnel ventilation outlets to pollutant concentrations was negligible for all receptors including at highly populated suburbs (Haberfield, Rozelle, Iron Cove, St Peters, Birchgrove) and schools
- Filtration would not remove 100 per cent of pollutants and does not remove all pollutant types
- The assessment of filtration concluded that filtration would not materially reduce annual $PM_{2.5}$ concentrations. If outlet emissions were eliminated, the largest reduction in annual average $PM_{2.5}$ concentrations that people breathe would be 0.25 µg/m^3; with the reduction at most locations significantly less than this. A change in concentration of this magnitude would not be able to be reliably detected in ambient monitoring
- Including filtration in the ventilation facilities would result in no material change in air quality in the surrounding community when compared to the current project ventilation system and outlet design
- Any predicted changes in concentration were driven by changes in the traffic volumes on the modelled surface road network, not by the tunnel ventilation outlets.

Very few tunnels around the world (new or under construction) are equipped with air treatment systems. Out of the tens of thousands of kilometres of tunnels in the world, there are around 75 installations of electro-static precipitators to remove particulate matter, although many of them have not been activated. There are five installations of de-nitrification systems to remove NO_2. Evidence to date suggests that the effectiveness of such controls when applied to road tunnels is limited to specific situations and that the technologies are rarely used. A French Government review of international tunnel air treatment, updated in December 2016[10], stated:

'…recent tunnel projects often propose the use of air treatment systems in response to concerns expressed by local populations, who have reason to be worried about changes in their environment. Before turning to systems that may effectively provide an answer to a local pollution concern, conventional ventilation techniques (using fresh airflows to dilute pollutants) should still be considered by making use of the appropriate means, i.e. playing on the airflows and concentrations of the discarded vitiated air, as well as on the location and configuration of discharges and any other method likely to improve the dispersion of pollution and so protect the most at-risk areas'

'…several tunnels that have been equipped with electrostatic filters have subsequently used them very little,'

This is consistent with the Victorian Minister for Planning's recent determination for the Westgate Tunnel project which stated:

'I am not persuaded that requiring immediate installation of filtration equipment in the tunnels ventilation systems is justified or cost-effective, or will even deliver a measurably better outcome. Unless a better environmental outcome can be expected, requiring such a measure would be an expensive gesture, distracting both investment and attention from better, and better-targeted, measures'.

The NSW Government routinely reviews international best practice on tunnel ventilation systems, however, Roads and Maritime is not aware of any specific government policy on filtration. The ACTAQ technical paper on the approach to ventilation systems (TP04: Road Tunnel Ventilation Systems Roads and Maritime 2014) can be found on the Chief Scientist's website[11].

[10] http://www.cetu.developpement-durable.gouv.fr/IMG/pdf/cetu_di_traitement_de_l_air-en-19_07_2017.pdf
[11] http://www.chiefscientist.nsw.gov.au/reports/advisory-committee-on-tunnel-air-quality

It has been shown that control of pollutants at the source, ie vehicle emissions controls, is significantly more effective in improving local and regional air quality (Advisory Committee on Tunnel Air Quality (ACTAQ) 2014, National Health and Medical Research Council (NHMRC) (2008)). The NSW Government is committed to continuing to work with the Australian Government to implement cleaner fuels and cleaner vehicles, hence reducing emissions at source. Total emissions from the Sydney vehicle fleet have reduced over the last 20 years and are projected to continue to reduce into the future.

As part of the air quality impact assessment, likely worst case scenarios were taken into account by using a sophisticated meteorological and dispersion model utilising a full year of meteorological data. Accumulation of pollutants under low wind speeds was included in the assessment. Meteorological information including wind direction, wind speed, calms/low wind speed conditions, and temperature inversions, were used to model the peak concentration of air pollutants that may occur. The outlets are designed to adequately disperse pollution for all meteorological conditions, including low wind speeds and temperature inversions. The maximum 1 hour and 24 hour average predictions in the EIS show that the resulting contributions to pollutant levels at the ground surface due to emissions from the ventilation outlets, would be too small to be measured even with worst case dispersion conditions.

The operational design of the project has considered airspace protection and associated risks and hazards. Design of the ventilation facility would meet the requirements of the Australian Government's Civil Aviation Safety Authority (CASA) noting the limitations on the velocity and height of the emissions plume. The proposed ventilation outlets are designed to be below prescribed airspace heights.

C9.11.2 Impacts on air quality at elevated receptors during operation

Submitters raised concerns about air quality impacts for residents on hills or in high rise buildings, in particular:

- Residential properties at the same elevation as the ventilation outlets
- The height of ventilation facilities, the top of which will have similar elevations to Orange Grove Primary School
- Particulate matter impacts on buildings over three storeys.

Response

An assessment was undertaken to determine the air quality impacts of the project on elevated receptors (elevated by buildings and terrain) (refer to section 9.7.5 of the EIS). The air quality assessment modelled pollution dispersion taking into account local terrain and topography, including the presence of buildings in urban areas. The terrain within the project footprint varies from an elevation of around 10 metres Australian Height Datum (AHD) at the western end at Haberfield to an elevation of around 14 metres AHD at the Rozelle interchange and 10 metres AHD at St Peters, at the southern end of the project footprint.

Terrain effects are taken into account in the dispersion model using terrain data sourced from the ASTER website. The ventilation outlets in the dispersion model are therefore located in a terrain model that is representative of the real world. Pollution from the ventilation outlets and surface roads flows around the terrain in the model, and this does have an effect on dispersion. It is again noted that the pollutant contributions from the ventilation outlets are minor when compared with the surface road and background.

Concentrations at two elevated receptor heights (10 metres and 30 metres) were considered for annual mean and 24 hour $PM_{2.5}$. It should be noted that, at the 10 metre and 30 metre heights, it was not necessarily the case that there were existing buildings at these heights at sensitive receptor locations.

The intent of the elevated receptor analysis was twofold:

- To determine potential adverse air quality impacts on existing elevated receptors
- To identify if there are potential constraints that should be taken into account for potential future developments, and which should be addressed through planning controls.

The project ventilation system has been designed and would be operated so that it will achieve some of the most stringent standards in the world for in-tunnel air quality, and will be effective at maintaining local air quality. An assessment was undertaken to determine the air quality impacts of the project on elevated receivers (elevated by buildings and terrain) (refer to section 9.7.5 of the EIS). The implications of the results of the assessment of elevated receivers relevant to future development can be summarised as follows:

- Future developments to the height of 10 metres should be possible at all locations in the study area based on the assumptions in the assessment (see **section C9.11)**
- The predictions do not indicate the need for any restrictions on future developments to 30 metres height, except in the immediate vicinity of ventilation outlets, in particular at St Peters interchange:
  - The ventilation outlets were predicted not to result in adverse air quality impacts at any existing receptors as there are no existing buildings 30 metres or higher located close to the proposed ventilation facilities at St Peters
  - Planning controls should be developed in the vicinity of St Peters to ensure future developments at heights 10 metres or higher are not adversely impacted by the ventilation outlets. Development of planning controls would need to be supported by detailed modelling addressing all relevant pollutants and averaging periods.

The future development of land (including rezonings) in the vicinity of St Peters that may involve multi-story buildings at heights of 10 metres or higher would need to consider the air dispersion performance of the Campbell Road ventilation facility. Roads and Maritime would assist local councils in determining any relevant land use considerations applicable to future development for inclusion in local environmental plans or development control plans, where required.

C9.11.3 Air quality impacts from the ventilation facilities on Rozelle Public School

Submitters raised concerns about air quality impacts for students at Rozelle Public School from the ventilation outlet emissions, in particular:

- Concerns that pupils at Rozelle Public School will be exposed to 24 µg/m^3 of $PM_{2.5}$ and that emissions above 8 µg/m^3 would contravene existing guidelines
- What ultrafine particles will be contributing to the mix of exhaust gases at Rozelle Public School
- Concerns about the impact on air quality at Rozelle Public School due to ventilation facilities not being filtered, particularly in regards to $PM_{2.5}$ pollutants.

Response

Rozelle Public School was individually assessed in the M4-M5 Link EIS as community receptor CR31. As a result of the Iron Cove Link reducing traffic on Victoria Road, air quality is predicted to improve at Rozelle Public School. For example, annual average $PM_{2.5}$ is predicted to reduce by between 0.4 µg/m^3 and 0.8 µg/m^3 as a result of the project (see Figure 9-51 from section 9.7.3 of the EIS).

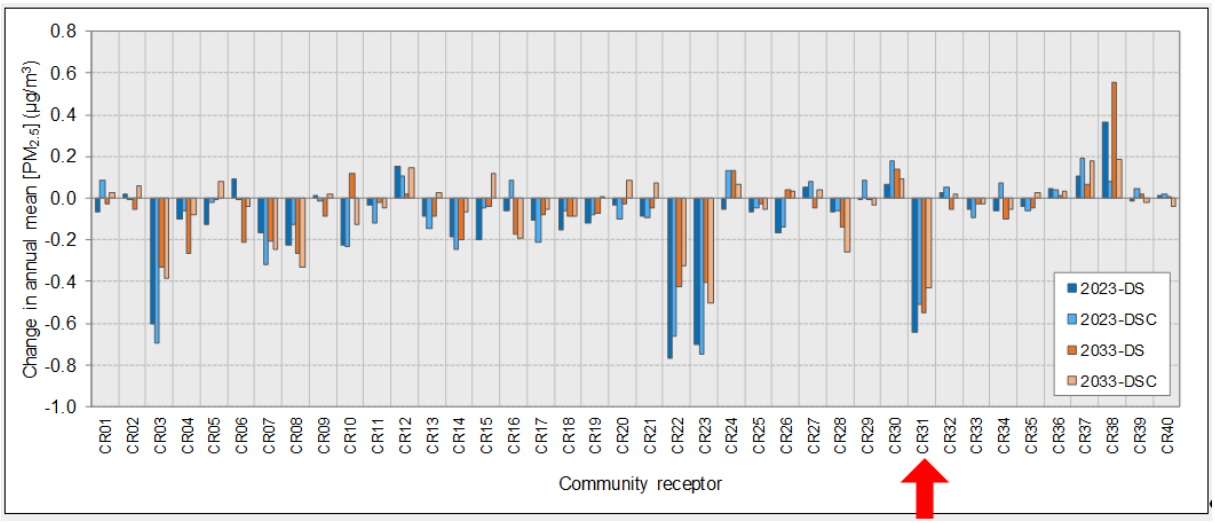


Figure C9-2 Change in annual mean $PM_{2.5}$ concentration at community receptors (with-project (DS) and cumulative (DSC) scenarios, relative to corresponding Do Minimum scenarios)

The air quality assessment provides emission profiles for each ventilation outlet (refer to section I.1.3 of Annexure I of Appendix I (Technical working paper: Air quality) of the EIS. Detailed contour plots which map the predicted dispersion of airborne emissions from the ventilation outlets are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS. The contour plots show annual mean and maximum 24 hour mean concentrations of NO_X, PM_{10} and $PM_{2.5}$ for the assessment year 2023 and 2033 for each outlet.

The effects of terrain and relative heights are taken into account in the dispersion modelling. The combined effect of the Rozelle interchange and Iron Cove Link outlets on the Rozelle Public School is shown in the EIS. For example, Figure 8-73 shows the contribution of the outlets to annual average $PM_{2.5}$ at the school.

The air quality impact assessment determined that emissions from the project ventilation outlets at Iron Cove and Rozelle, even in the regulatory worst case scenarios, would not result in significant changes to local air quality. The Iron Cove Link ventilation outlet was predicted not to result in significant changes to air quality at Rozelle Public School.

Consistent with other approved tunnel projects such as NorthConnex, it is expected the project will be required to carry out air monitoring around the locations for ventilation outlets during operation to demonstrate compliance with air quality standards (see **section C9.18** for further details), including on sensitive receptors such as Rozelle Public School.

There are currently no standards for assessment of UFPs. These are particles with a diameter of less than 0.1 µm. As UFPs are a subset of $PM_{2.5}$, for the purpose of the project air quality assessment it is considered that the effects of UFPs on health are included in the assessment of $PM_{2.5}$.

C9.11.4 Impact of traffic using the tunnels and concentrating the air pollution at ventilation facilities

Submitters raised concerns that the concentration of emissions such as carbon dioxide coming from the ventilation outlet would concentrate the pollution from the subterranean road network.

Response

Much of the community would experience no change or a small improvement in air quality as a result of the project. This is due to traffic from surface roads being moved to the tunnels. The dispersion of emissions from the ventilation outlets is very effective and would result in swift dilution of emissions minimising the accumulation of air pollutants at the ground surface in adjacent areas.

The Australian Design Rules set limits on the exhaust emissions of CO, NO_X and PM. Some of the pollutants in vehicle exhaust are not regulated, such as the greenhouse gases (carbon dioxide (CO_2) and methane. Greenhouse gases are considered as part of the greenhouse gas assessment (see responses in **section C22.3.1**).

The air quality assessment provides detailed contour plots which map the predicted dispersion of airborne emissions from the ventilation outlets. These maps are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS. The contour plots show annual mean and maximum 24 hour mean concentration of NO_X, PM_{10} and $PM_{2.5}$ for 2023 and 2033 for both the 'Do something' and 'Do something cumulative' scenarios. The air quality impact assessment determined that emissions from the project ventilation outlets, even in the regulatory worst case scenarios, would not result in significant changes in local air quality.

C9.11.5 Impacts on air quality from ventilation facilities (general)

Submitters expressed general concerns about impacts on air quality from ventilation facilities. These concerns included:

- Localised impacts of ventilation outlets on air quality is not accounted for
- The impact of emissions from ventilation outlets in the event of light winds
- Will fans be turned down or off if plume rise from the ventilation facilities is found to be a hazard? Will local residents be subjected to increased pollution loads because the velocity of discharge from the ventilation facility will be reduced
- Impacts of ventilation facilities on flora and fauna
- Dust impacts from ventilation facilities
- Level of pollution from exhaust outlets in close proximity to houses, schools and local businesses
- Concern that ventilation facilities will impact on air quality. Request that conditions of approval note that air quality will not be worsened from these facilities
- Residents living within proximity to two ventilation facilities [at Rozelle] will be exposed to pollution levels of around 12 µg/m^3 (from surface roads) and 12 µg/m^3 (from ventilation facilities) resulting in 24 µg/m^3 $PM_{2.5.}$

A submitter supported the use of ventilation facilities to expel emissions from the tunnels.

Response

In NSW the statutory methods used for assessing air pollution from stationary sources are listed in the NSW Approved Methods (NSW EPA 2016). These criteria include the latest (2016) update of the NSW Approved Methods for particulate matter. The updated NSW Approved Methods specify air quality criteria for many other substances, including air toxics.

As part of the air quality impact assessment, likely worst case scenarios were taken into account by using a sophisticated meteorological and dispersion model utilising a full year of meteorological data. This included assessment of localised accumulation of pollutants under low wind speeds. Meteorological information including wind direction, wind speed, calms/ low wind speed conditions, and temperature inversions, were used to model the peak concentration of air pollutants that may occur.

The tunnel ventilation system has been designed to achieve acceptable in-tunnel air quality outcomes for CO, NO_2 and visibility (as a measure of in-tunnel particulate matter concentrations) for traffic volumes up to and including the maximum traffic throughput capacity of the tunnels as well as incident and congested conditions. Continuous monitoring will also be undertaken in the ventilation outlets to demonstrate ongoing compliance with the emission limits. Monitoring would include exit velocity and temperature in addition to pollutants (see **section C9.19.1** for further details on air quality monitoring). The velocity monitors in combination with the air quality monitors will be used to control the ventilation fans within the tunnel to manage air quality.

The air quality assessment provided contour plots mapping dispersion of emissions for the M4-M5 Link. These maps include the contributions from the background, from surface roads and from tunnel ventilation outlets. These maps are provided in section 9.7.3 of the EIS. Emission profiles were also provided for each ventilation outlet (refer to section I.1.3 of Annexure I of Appendix I (Technical working paper: Air quality) of the EIS). Detailed contour plots which map the predicted dispersion of airborne emissions from the ventilation outlets are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS. The contour plots show annual mean and maximum 24 hour mean concentration of NO_X, PM_{10} and $PM_{2.5}$ for 2023 and 2033 for each ventilation outlet.

The air quality assessment demonstrated that any predicted impact on local air quality due to emissions from the ventilation outlets would be very small. Specifically the following:

- Under expected traffic conditions, the predicted contribution of tunnel ventilation outlets to pollutant concentrations was negligible for all receptors including at highly populated suburbs (Haberfield, Rozelle, Iron Cove, St Peters, Birchgrove). Detailed results were provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS
- The regulatory worst case scenarios would not result in significant changes in local air quality including on residential receptors and sensitive community receptors such as child care centres, open space and playgrounds or on flora and fauna
- Any predicted changes in pollutant concentration were driven by changes in the traffic volumes on the modelled surface road network, not by the tunnel ventilation outlets.

The ventilation outlet contributions (from all ventilation outlets, not just at Rozelle), is between 0.81 and 5.61 µg/m^3 depending on the scenario. This is shown in Figure 9-59 of the EIS. For Rozelle, the contour plots Figure 9-60 and Figure 9-61 in section 9.7.1 of the EIS show the changes from all surface roads sources and ventilation contributions spatially. These figures show the area around Victoria Road at Rozelle has a predicted reduction in concentrations due to removal of surface road traffic from Victoria Road, even with the ventilation outlets in the area.

C9.12 Operational air quality impacts of the Rozelle ventilation facility

471 submitters raised concerns about impacts to air quality resulting from the Rozelle ventilation facility. Refer to section 9.7 and Appendix I (Technical working paper: Air quality) of the EIS for details of the air quality assessment findings.

C9.12.1 Air quality impacts due to Rozelle ventilation facility

Submitters raised concerns about air quality impacts from the Rozelle ventilation facility. Specific issues raised relate to:

- Adverse impacts to air quality at residential properties and other sensitive receivers
- Adverse impacts to air quality along the Bay Run route
- A concentration of emissions from the ventilation facility at Rozelle due to the interchange having steep gradients and long climbs
- Adverse impacts to air quality within the green corridor from Buruwan Park along Railway Parade, Annandale
- Concentrations of emissions of PM_{10} and NO_2 will exceed regional air quality guidelines
- The inclusion of a ventilation facility under the Sydney Airport flight path is contrary to best practice
- The effect on air quality in close proximity to the ventilation outlets on a calm day
- Concerns about air quality impacts at elevated receptors including schools and residential properties at Annandale, Lilyfield, Rozelle and Balmain from the Rozelle ventilation facility
- Concern about impacts from the unfiltered ventilation facility on residents at Annandale, Lilyfield, Rozelle and Balmain and the proposed recreation area at the Rozelle Rail Yards.

Response

The Rozelle ventilation facility at the Rozelle interchange would include a ventilation supply facility at the Rozelle West motorway operations complex (MOC2) and a ventilation outlet at the Rozelle East motorway operations complex (MOC3). The total tunnel emissions, and therefore the emissions from the outlets, have been calculated based on the sum of each tunnel section's emissions, factoring in the length of each section, the time taken for vehicles in the tunnel to pass through each section, the density of vehicles in the tunnel and the respective gradients. The air quality impact assessment in the EIS determined that emissions (including PM_{10} and NO_2) from the project ventilation outlet at Rozelle, even in the regulatory worst case scenarios, would not result in significant changes in local air quality including on residential receptors and sensitive community receptors such as open space, parks (eg Buruwan Park), active transport routes (eg Bay Run) and playgrounds.

For $PM_{10,}$ the maximum contribution of the ventilation outlets under the worst case scenarios, would be small. For the worst case scenarios for both the annual mean and maximum 24 hour metrics, the outlet contributions were less than 10 per cent of the respective criteria. This would be significant for some receptors, but exceedances of the criteria due to the ventilation outlets alone would still be unlikely.

A detailed analysis was conducted for one hour average concentration of NO_2. The analysis showed that maximum outlet contributions occurred when other contributions were low, such that overall NO_2 concentrations were well below the criterion or even the predicted maximum.

Consistent with other approved tunnel projects such as NorthConnex, it is expected the project will be required to carry out air quality monitoring around the locations for ventilation outlets during operation to demonstrate compliance with air quality standards.

The operational design of the project has considered airspace protection and associated risks and hazards. Design of the ventilation facility would meet the requirements of CASA, noting the limitations on the velocity and height of the emissions plume as well as limitations on the height of buildings and structures around Sydney Airport (refer to section 25.2.7 of the EIS). No buildings and structures that form part of the project are designed to intrude into prescribed airspace. The proposed ventilation outlets at the Rozelle interchange (at the Rozelle Rail Yards) are designed to be below prescribed airspace heights.

As part of the air quality impact assessment, likely worst case scenarios were taken into account by using a sophisticated meteorological and dispersion model utilising a full year of meteorological data. This included assessment of localised accumulation of pollutants under low wind speeds. Meteorological information included in the modelled scenarios included wind direction, wind speed, calms/low wind speed conditions, and temperature inversions, were used to model the peak concentration of air pollutants that may occur. The ventilation outlets were predicted to not result in localised adverse air quality impacts during low wind conditions at any existing receptors such as schools, child care centres, open space or residential receptors.

See the responses in **section C9.11.1** regarding filtration of ventilation facilities and **section C9.11.2** for a discussion relating to elevated receptors.

C9.13 Operational air quality impacts of the Iron Cove Link ventilation facility

73 submitters raised concerns about impacts to air quality from the Iron Cove Link ventilation facility. Refer to section 9.7 and Appendix I (Technical working paper: Air quality) of the EIS for details of the air quality assessment findings.

C9.13.1 Air quality impacts due to the Iron Cove Link ventilation facility

Submitters raised concerns about air quality impacts from the Iron Cove Link ventilation facility. Specific concerns raised relate to:

- Negative impacts on air quality at Rozelle Public School, Orange Grove Public School and Sydney Secondary College (Balmain Campus)
- Negative impacts on air quality at residential properties along Terry Street, Springside Street and Callan Street and impacts at Victoria Road

- Negative impacts on air quality at residential properties at Rozelle
- Concentrations of emissions of PM_{10} and NO_2 will exceed regional air quality guidelines
- Emissions from the Iron Cove Link ventilation facility being blown toward the high density apartments at Balmain Shores due to prevailing southerly winds
- Pollutants from the ventilation facility will be blown towards nearby community members.

Response

The air quality assessment provides emission profiles for each ventilation outlet (refer to section I.1.3 of Annexure I of Appendix I (Technical working paper: Air quality) of the EIS). Detailed contour plots which map the predicted dispersion of airborne emissions from the ventilation outlets are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS. The contour plots show annual mean and maximum 24 hour mean concentrations of NO_X, PM_{10} and $PM_{2.5}$ for 2023 and 2033 for each ventilation outlet, including the Iron Cove Link ventilation outlet.

The air quality impact assessment in the EIS determined that emissions from the Iron Cove Link ventilation outlet, even in the regulatory worst case scenarios, would not result in significant changes to ground level concentrations of pollutants. The ventilation outlet was predicted not to result in significant changes to air quality at any existing receptors including on residential receptors and sensitive community receptors such as education facilities (Rozelle Public School, Orange Grove Public School and Sydney Secondary College) and playgrounds.

Consistent with other approved tunnel projects such as NorthConnex, it is expected the project will be required to carry out air quality monitoring around the locations for ventilation outlets during operation to demonstrate compliance with air quality standards (see **section C9.18.1** for further information on monitoring).

As part of the air quality impact assessment, likely worst case scenarios were taken into account by using a sophisticated meteorological and dispersion model utilising a full year of meteorological data. The assessment included an accumulation of pollutants under low wind speeds. Meteorological information including wind direction, wind speed, calms/low wind speed conditions, and temperature inversions, were used to model the peak concentration of air pollutants that may occur. Even accounting for wind direction, the ventilation outlet was predicted not to result in significant changes to air quality at any existing receptors, including high density apartments at Balmain Shores.

C9.13.2 Air quality impacts due to the Iron Cove Link ventilation facility not being filtered

Submitters raised concerns about air quality impacts from the Iron Cove Link ventilation facility not being filtered. Specific concerns related to:

- Submitter believes conditions of consent should be imposed to require the use of filtered ventilation systems
- Traffic congestion within the tunnels will add to the intensity of emissions from the unfiltered ventilation facilities.

Response

See the responses in **section C9.11.1** regarding the filtration of ventilation facilities.

C9.14 Operational air quality impacts of the Campbell Road ventilation facility at St Peters

397 submitters raised concerns about impacts to air quality from the Campbell Road ventilation facility. Refer to section 9.7 of the EIS and Appendix I (Technical working paper: Air quality) of the EIS for details of the air quality assessment findings.

C9.14.1 Air quality impacts due to the Campbell Road ventilation facility at St Peters

Submitters raised concerns about air quality impacts from the Campbell Road ventilation facility at St Peters. Specific issues raised relate to:

- Adverse impacts on air quality at St Peters Primary School during operation
- The additional ventilation facility will increase the vehicle pollution in an area where the prevailing south and north-westerly winds sends that pollution over residences, schools and sports fields
- Adverse impacts to air quality at St Peters, particularly in the context of it being located in low lying topography.

Response

The Campbell Road ventilation facility at St Peters would include a ventilation supply facility and ventilation outlet facility. The air quality assessment provided emission profiles for each ventilation outlet (refer to section I.1.3 of Annexure I of Appendix I (Technical working paper: Air quality) of the EIS). Detailed contour plots which map the predicted dispersion of airborne emissions from the ventilation outlets are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS. The contour plots show annual mean and maximum 24 hour mean concentrations of NO_X, PM_{10} and $PM_{2.5}$ for 2023 and 2033 for each ventilation outlet.

The air quality impact assessment likely worst case scenarios were taken into account by using a sophisticated meteorological and dispersion model utilising a full year of meteorological data. This included assessment of localised accumulation of pollutants under low wind speeds. Meteorological information including wind direction, wind speed, calms/low wind speed conditions, and temperature inversions, combined with a model of the topography (including low lying and elevated areas), were used to model the peak concentration of air pollutants that may occur. Even accounting for wind direction the ventilation outlet was predicted not to result in significant changes in air quality impacts at any existing receptors including residences, school and sports fields.

The air quality impact assessment in the EIS determined that emissions from the project ventilation outlet at St Peters, even in the regulatory worst case scenarios, would not result in significant changes in on local air quality. The ventilation outlet was predicted not to result in significant changes in air quality at any existing receptors including on residential receptor and sensitive community receptors such as education facilities (such as St Peters Primary School) and open space. Impacts on Sydney Park and new open space created by the New M5 project are therefore predicted to be negligible.

Consistent with other approved tunnel projects such as NorthConnex, it is expected the project will be required to carry out air quality monitoring around the locations for ventilation outlets during operation to demonstrate compliance with air quality standards. (see **section C9.18.1** for further information on monitoring).

The air quality assessment modelled pollution dispersion taking into account local terrain and topography, including the presence of buildings in urban areas. The terrain within the project footprint varies from an elevation of around 10 metres AHD at the western end at Haberfield and 10 metres at St Peters, at the southern end of the project footprint. An assessment was undertaken to determine the air quality impacts of the project on elevated receptors (elevated by buildings and terrain) (refer to section 9.7.5 of the EIS). A discussion relating to elevated receptors is provided in **section C9.11.2**.

C9.15 Operational air quality impacts of the Parramatta Road ventilation facility at Haberfield

Six submitters raised concerns about impacts to air quality from the Haberfield ventilation facility. Refer to section 9.7 of the EIS and Appendix I (Technical working paper: Air quality) the EIS for details of the air quality assessment findings.

C9.15.1 Air quality impacts due to the Parramatta Road ventilation facility at Haberfield

Submitters raised concerns about air quality impacts from the Haberfield (Parramatta Road) ventilation facility. Specific issues raised relate to:

- Adverse impacts on air quality at Haberfield Public School during operation
- The Haberfield ventilation facility will release toxic emissions from two WestConnex projects over the community.

Response

The Parramatta Road ventilation facility at Haberfield was designed to accommodate the M4-M5 Link ventilation requirements with a separate outlet and plant room provided within the M4 East Haberfield ventilation facility. Construction of the outlet is being completed as part of the M4 East project to minimise further construction impacts in the area. The fitout of the outlet would be undertaken by the M4-M5 Link contractor to ensure that it is appropriate for project capacity requirements.

The air quality assessment provides emission profiles for each ventilation outlet (refer to section I.1.3 of Annexure I of Appendix I (Technical working paper: Air quality) of the EIS). Detailed contour plots which map the predicted dispersion of airborne emissions from the ventilation outlets are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS. The contour plots show annual mean and maximum 24 hour mean concentration of NO_X, PM_{10} and $PM_{2.5}$ for 2023 and 2033 for each ventilation outlet.

The assessment determined that emissions from the project ventilation outlet at Haberfield, even in the regulatory worst case scenarios, would not result in significant changes to local air quality. The ventilation outlet was predicted not to result significant changes to air quality at any existing receptors including on residential receptor and sensitive community receptors such as education facilities (including Haberfield Public School) and open space.

Consistent with other approved tunnel projects such as NorthConnex, it is expected the project will be required to carry out air quality monitoring around the locations for ventilation outlets during operation to demonstrate compliance with air quality standards (see **section C9.18.1** for further information on monitoring).

C9.16 Air quality impact from surface roads during operation

754 submitters raised concerns about impacts to air quality from surface roads. Refer to section 9.7 and Appendix I (Technical working paper: Air quality) of the EIS for details of potential air quality impacts during operation.

C9.16.1 Increase in air quality impacts from surface roads related to the project

Submitters have expressed concern that increased traffic on surface roads and intersections as a result of the M4-M5 Link project and the re-direction of traffic to new areas (including 'rat-runs' through local streets) would result in increased air pollution.

Submitters raised specific concerns about increased vehicle emissions at the following locations:

- At or near St Peters due to the newly aligned Campbell Street causing congestion on Bourke Road and Gardeners Road in proximity to King Street, Enmore Road and Canal Road
- At Rozelle, specifically along Victoria Road between Iron Cove Bridge and Anzac Bridge, at Rozelle interchange and surrounding streets
- At Drummoyne, Annandale, Haberfield, Easton Park, Parramatta Road, Anzac Bridge, Erskineville and Alexandria.

Other concerns raised include:

- Exposure of residents living alongside roads or nearby communities
- The scale of air pollution on surface roads caused by the project and assessed in the EIS
- Air quality changes in the area along roadsides near the tunnel portal locations from congestion including stop-start traffic
- Air quality changes from an additional set of traffic lights on City West Link due to the Rozelle interchange connection from City West Link
- The air quality impacts on cyclists that use active transport infrastructure adjacent to open roadways
- Ongoing air quality impacts due to rat running from toll avoidance

- Cumulative impacts of ventilation facilities and surface roads not sufficiently assessing particulates and NO_2 pollution
- Installation of traffic lights near the tunnel portal north of the rail stop at Rozelle will increase emissions from vehicles stop-starting.

Response

Much of the community, including active transport users would experience no change or a small improvement in air quality as a result of the project.

The prediction for the future years (2023 and 2033) includes the changes in emission from surface road traffic for those years. As surface road traffic emissions dominate the background air quality in the project area, the future year background air quality is considered to be a reasonable prediction of future local air quality backgrounds in the study area.

For surface roads the emission and dispersion modelling was undertaken for the main roads in the study area, as defined in the traffic assessment (refer to Chapter 8 (Traffic and transport) of the EIS). The traffic assessment considered upgrades to the operational traffic network from the new intersections, road alignments (such as at Campbell Road) and traffic signal arrangements. The traffic assessment also considers toll avoidance in its traffic scenarios, which support the air quality assessment. The surface road air quality modelling is based on emissions from traffic for each hour of the 24 hour day and therefore includes congested traffic in peak hours, which would be the worst case surface road traffic. The increase in traffic is accounted for by using a 'peak spreading' approach which also takes into account congestion or stop-start conditions. The following general conclusions have been drawn from the air quality assessment:

- The predicted total concentrations of all criteria pollutants at receptors were usually dominated by the existing background contribution
- For some pollutants and metrics (such as annual mean NO_2) there was predicted to be a significant contribution from the modelled surface road traffic
- For some air quality metrics (one hour NO_2 and 24 hour PM_{10}), exceedances of the criteria were predicted to occur both with and without the project. However, where this was the case the total numbers of receptors with exceedances decreased slightly with the project and in the cumulative scenarios
- Where increases in pollutant concentrations at receptors were predicted, these were mostly small. A very small proportion of receptors were predicted to have larger increases. However, it is likely that the predictions at these locations were overly conservative
- The spatial changes in air quality as a result of the project were quite complex, reflecting the complex changes in traffic on the network. For example:
  - There were predicted to be marked reductions in pollutant concentrations along Dobroyd Parade, City West Link and Parramatta Road to the southeast of the Parramatta Road ventilation station. In the 2023 'Do Minimum' scenario, the traffic to and from the M4 East tunnel would access the tunnel using these roads. In the 'with project' scenarios, the M4-M5 Link tunnel connects to the M4 East tunnel, thus relieving these roads
  - There was predicted to be a substantial reduction in concentrations along the Victoria Road corridor south of Iron Cove at Rozelle, due to traffic being diverted through the Iron Cove Link tunnel
  - There would also be reductions in concentration along General Holmes Drive, Princes Highway and the M5 East Motorway
  - There would be additional traffic (and an increase in pollutant concentrations) to the north of Iron Cove Link and near Anzac Bridge as a result of the general increase in traffic due to the project
  - Concentrations were also predicted to increase along Canal Road, which would be used to access St Peters interchange.

The air quality assessment provides detailed contour plots which map the predicted dispersion modelling for the expected traffic scenarios. These maps are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS. The contour plots show annual mean and maximum 24 hour mean concentration of NO_X, PM_{10} and $PM_{2.5}$ for 2023 and 2033 for both the 'Do something' and 'Do something cumulative' scenarios. Contour plots for 2023 and 2033 showing the change in pollutants as a result of the project, are shown in section 9.7.3 (refer to Figure 9-31 and Figure 9-32) of the EIS.

Further details on the cumulative impact assessment are discussed in **section C9.20**.

The construction or modification of intersections with traffic lights (traffic signals) for the project is required where free flow connections are not optimal due to design or connectivity constraints. The emissions model used in the air quality assessment includes allowance for emissions from stop-start traffic.

St Peters interchange

Predicted changes to traffic flows in around St Peters for average weekday traffic is similar for 2023 and 2033 'With project' on surface roads. Predicted changes include the following (refer to Figure 8-13 and 8-14 in section 8.3.2 of the EIS).

- Reductions are forecast on sections of Canal Road
- Reductions are forecast on King Street
- Minor increases are forecast on Enmore Road.

Increases in surface traffic would increase potential pollutant concentrations in these areas while decreases in traffic flows would correspond to decreases in potential pollutant concentrations.

Impacts relating to surface roads at and around the St Peters interchange resulting from the New M5 project were assessed in the New M5 EIS (Roads and Maritime 2016).

C9.17 Odour impacts during operation

Four submitters raised concerns about odour impacts during operation. Refer to section 9.9 and Appendix I (Technical working paper: Air quality) of the EIS for details of potential odour impacts.

C9.17.1 Generation of odour during operation

Submitters raised concern regarding the air quality impacts from odour created during the operational phase.

Response

The issue of odour is not especially relevant to motor vehicle emissions. Odours associated with motor vehicle emissions tend to be very localised and short-lived, and there are not expected to be any significant changes in odour as a result of the project. The pollutants included in the air quality impact assessment were taken to be representative of other odorous pollutants from motor vehicles, and the corresponding one-hour odour assessment criteria were taken from the NSW Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC 2005). There are no odour criteria in the NSW Approved Methods for shorter time periods. The change in the maximum one hour concentration of each pollutant was an order of magnitude below the corresponding odour assessment criterion in the NSW Approved Methods.

The dispersion of emissions from the ventilation outlets is very effective and the dilution achieved restricts the accumulation of any odours to the local community. Noticeable odours have not been recorded from any existing tunnel ventilation facilities in Sydney.

C9.18 Air quality monitoring during operation

54 submitters queried air quality monitoring of the project. Refer to **Chapter E1** (Environmental management measures) for details of the revised environmental management measures for operational air quality impacts including monitoring.

C9.18.1 Future air quality monitoring

Submitters raised questions regarding the future air quality monitoring (both ambient and in-tunnel) during the operation of the M4-M5 Link project. Submitters have requested the following:

- Independent monitoring of air quality schools, specifically Haberfield Public School, Rozelle Public School and Sydney Secondary College, for data comparison purposes for at least 10 years following completion of the projects construction
- Further evidence of air quality monitoring data from Rozelle Public School for the past year along with predicted values at the school for the next 10 years at 9.00 am, noon and 3.00 pm
- Monitoring of air quality at aged care facilities around the project
- Monitoring to take place near the intersection of Lilyfield Road and Victoria Road to monitor the emissions from the ventilation facilities
- Future air quality monitoring following construction should be available online to the public and summarised historically
- Monitoring should include indoors at nearby homes and schools as part of the conditions of approval, the results of which should be publically available
- The community should select locations for air quality monitoring during operation
- Monitoring of ultra-fine particles around the ventilation outlets and in schools
- Air quality monitoring at locations predicted to experience significant increase in traffic including Victoria Road, from the Irone Cove Link tunnel portal at Rozelle through to Drummoyne, Anzac Bridge and the Western Distributor, Canal Road, Gardeners Road and adjoining roads in the Mascot area
- Approval measures to monitor and limit in-tunnel pollutants with the most stringent limits used internationally
- Monitoring should occur for multiple years and extra monitoring should occur when a disaster occurs in the tunnels
- Monitoring of air quality on an hourly basis so that we can ensure that average air quality is not disguising high levels of pollutants at times when children are particularly exposed eg lunch and recess
- The air monitoring network operated by NSW EPA/OEH has no sites adjacent to busy roads.

Response

During operation, continuous in-tunnel monitoring will be undertaken to demonstrate ongoing compliance with the in-tunnel emission limits. In addition, smoky vehicle cameras will be installed to automatically detect vehicles with excessive exhaust smoke, with penalties applying to offenders. A similar initiative is in place for the M5 East tunnel and has resulted in a reduction of smoky vehicles using the tunnel.

Continuous monitoring will also be undertaken in the ventilation outlets to demonstrate ongoing compliance with the emission limits. Monitoring would include exit velocity and temperature in addition pollutants.

Should the project be approved, it is anticipated that there will be a requirement within the conditions of approval to undertake ambient air quality monitoring around the ventilation outlets at least one year prior to opening and continue this monitoring for at least two years after opening. This is consistent with the conditions of approval imposed for the M4 East and New M5 projects. The locations of the monitors and duration of monitoring would be agreed with an Air Quality Community Consultative Committee (see environmental management measure AQ29 in **Chapter E1** (Environmental management measures)). Rozelle Public School would be considered as an option. As an example, a monitoring station is currently being installed at Haberfield Public School which is located around 400 metres from the Parramatta Road Ventilation Facility (corner of Wattle St and Parramatta Road) as part of the M4 East project.

In addition, monitoring would continue at existing OEH and Roads and Maritime air quality monitoring stations. These stations provide hourly pollution concentration, 24 hour summaries and air quality index values (updated hourly) for a variety of pollutants.

The ambient air quality monitoring scheme will be developed and implemented in consultation with key stakeholders to confirm the EIS predictions that there would be no detectable change in air quality due to emissions from the ventilation outlets. Monitoring results will be reviewed after an appropriate period to determine if there is a need to continue monitoring.

Ventilation outlet monitoring stations would not be placed on intersections such as at Lilyfield Road/ Victoria Road intersection, as air quality at these locations would be dominated by surface road traffic.

The air quality assessment would not monitor the air quality in individual residences or schools as every property would be different based on the lifestyle of a household or use of the community facility (eg cigarette smoke, cooking and heating methods, and the materials and integrity of the building and its furnishings). The ambient air quality criteria are for outdoor air quality only. The EIS presents the contribution to air pollutants that the project is predicted to make to the ambient or external air quality prior to the individual contribution from lifestyle choices and other sources of pollutants.

As UFPs are a subset of $PM_{2.5}$, any potential health effects from UFPs are included in the dose-response functions for $PM_{2.5}$. For the purpose of the project air quality assessment it is considered that the effects of UFPs on health are included in the assessment of $PM_{2.5}$. Further discussion of UFP is provided in **section C9.1.2**

Existing air quality monitoring stations operated by OEH, Roads and Maritime and SMC are listed in **Table C9-1** and include locations on arterial and other busy roads. All relevant air quality monitoring results will be made available to the public on the WestConnex website[12]. Historic results for the WestConnex program of works are currently available on this website.

Disaster management would be under the control of emergency services and any monitoring relating specifically to an incident would be undertaken as directed by the emergency services. It should be noted however that fires are extremely rare within road tunnels.

C9.19 Operational air quality environmental management measures

165 submitters raised concerns about management of impacts. Refer to **Chapter E1** (Environmental management measures) for details of the updated environmental management measures for operational air quality impacts.

C9.19.1 Queries about what environmental management measures will be implemented during operation

Submitters requested information regarding what environmental management measures will be implemented during operation. Specific concerns and queries included:

- What measures are in place to reduce air pollution during the operational phase of the project
- What dust mitigation measures will be implemented at Toelle Street at Rozelle during operation
- Requests clarity on plans to manage pollution in the tunnels in the event of serious congestion, accidents or fire

[12] https://www.westconnex.com.au/local-updates?default_view=2&project=14&updates=9

- Requests clarity on management of particulate emissions in Canada Bay, Sydney, Botany and Burwood
- What management and mitigation measures will be in place in order to protect nearby schools and the community from dust and pollution
- What management measures will be in place to reduce the impact to Rozelle Public School and the whole community of Rozelle
- Requests clarity on how the Air Quality Community Consultative Committee will address ongoing air quality issues.

Response

Measures to manage and minimise emissions from operation of the project have been designed into the project. Additional mitigation measures, including measures to minimise dust, are described in **Chapter E1** (Environmental management measures). These measures would be implemented to reduce potential dust generation, emission and impacts in adjacent areas, including at Toelle Street, Rozelle. Measures included in the design of the project are described below.

Tunnel design

Tunnel infrastructure is designed in such a way that the generation of pollutant emissions by the traffic using the tunnel is minimised. The main considerations are minimising gradients and ensuring that lane capacity remains constant or increases from entry to exit point. Traffic management would also be used to improve traffic flows, which would result in reduced overall emissions.

Ventilation design and control

The tunnel ventilation system has been designed to achieve acceptable in-tunnel air quality outcomes for CO, NO_2 and visibility (as a measure of in-tunnel particulate matter concentrations) for traffic volumes up to and including the maximum traffic throughput capacity of the tunnels as well as for incidents and congested conditions.

- Public information and advice. Traffic lights, barriers, variable message signs, radio broadcasts, public address systems (used in emergencies) and other measures can help to provide driver information and hence influence driver behaviour in tunnels
- Details on in-tunnel air quality management during an incident such as a fire are discussed in **section C9.10.2**
- Cleaning the tunnel regularly assists in reducing concentrations of small particles (PIARC 2008) and is common practice in Sydney tunnels.

Detailed design of the in-tunnel monitoring system would be undertaken during future project development phases and will include the following:

- NO, NO_2, CO and visibility. Monitoring of each pollutant will be undertaken throughout the tunnel. The locations of monitoring equipment will generally be at the beginning and end of each ventilation section. This would include, for example, monitors at each entry ramp, exit ramp, merge point and ventilation exhaust and supply point. The location of monitors will be governed by the need to meet the in-tunnel air quality criteria for all possible journeys through the tunnel system, especially for NO_2. This will require sufficient, appropriately placed monitors to calculate a journey average
- Velocity monitors will be placed in each tunnel ventilation section and at portal entry and exit points. The velocity monitors in combination with the air quality monitors will be used to control the ventilation fans within the tunnel to manage air quality and to ensure net air inflow at all tunnel portals.

Air Quality Community Consultative Committee

The mandate of an Air Quality Community Consultative Committee would be set by conditions of approval for the project. Should the project be approved, it is anticipated that there will be a requirement within the conditions of approval to undertake ambient air quality monitoring around the ventilation outlets at least one year prior to opening and continue this monitoring for at least two years after opening. This is consistent with the conditions of approval imposed for the M4 East and New M5 projects. The location of the monitors and the duration of monitoring would be agreed with the committee.

C9.19.2 Request for additional air quality management measures

Submitters requested additional mitigation measures for air quality during operation. Specific concerns and queries included:

- Protection against dust, and pollution following construction at schools and residents, such as provision of air-conditioning
- Include filtration of outlets as a management measure for pollution from ventilation facilities
- Request an independent review of the current plans for ventilation facilities and air quality controls
- Requests planting of vegetation around ventilation facilities and tunnel entries and exits to provide a buffer from sensitive receivers for air pollution and to assist with air filtration
- Evergreen trees with dense canopies should be used in landscape planting as opposed to deciduous trees to assist in filtering air pollutants and provide visual screening
- The planting of vegetation around busy roads to provide a green barrier to reduce air pollution
- Request for an action plan to be put in place that addresses unexpected and detrimental effects of traffic flows on air quality changes
- Mitigation of air quality impacts should be addressed through the design to include the strictest standards.

Response

Air quality management

Measures to manage and minimise emissions during operation have been designed into the project (see **section C9.19.1**) where possible. Additional mitigation measures are described in **Chapter E1** (Environmental management measures).

Further details on the design of the project to minimise air quality impacts are provided in **section C9.19.2**.

Ventilation facilities

The assessment of the need for filtration determined that there was no beneficial impact on air quality by implementing tunnel air filtration (refer to **section C9.11.1** for further details).

DP&E is responsible for approving the project and would prepare the conditions of approval following a review of project documentation. In addition, the detailed design will be reviewed against the concept design, EIS and approval conditions, to determine whether the detailed design is consistent with the approved scope and, if not, further assessment and approval would be required under the EP&A Act. If further assessment and approval is required, the applicable statutory process for modification of the project will be followed prior to the commencement of construction of the relevant aspect of the project.

Landscape improvements

See the response in **section C9.6.1** regarding the effectiveness of vegetation for filtration of air pollutants. It would be more effective to minimise particulates at source through improved vehicle engine design than through planting buffer vegetation.

Traffic flow management

A review of the operational network performance will be undertaken 12 months and five years from the opening of the project. This would be to identify operational impacts of the project on surrounding arterial roads and major intersections in proximity to the Wattle Street interchange, Rozelle interchange and St Peters interchange. This process would be undertaken in consultation with local council, where required. Roads and Maritime will develop a strategy to ensure appropriate network integration of new infrastructure and signalling arrangements are provided where necessary. Maintaining good operational traffic flows will minimise emissions from vehicles.

C9.20 Cumulative air quality impacts

489 submitters raised concerns about cumulative air quality impacts. Refer to section 9.7 and Chapter 26 (Cumulative impacts) of the EIS for details of potential cumulative air quality impacts.

C9.20.1 Cumulative air quality impacts during construction and operation

Submitters raised concern regarding the combined impacts on air quality from numerous projects in the study area. Specific concerns relate to cumulative impacts of the following:

- The New M5, the M4 East and M4-M5 Link ventilation outlets specifically the St Peters Primary School being in between ventilation facilities
- The M4-M5 Link ventilation outlets under the Sydney Airport flight path
- The project with cruise ships at White Bay
- The combined portal emissions from the M4-M5 Link project and the proposed Western Harbour Tunnel project at Rozelle
- Current aircraft emissions with emissions from spoil truck movements at the Darley Road civil and tunnel site (C4), estimated at around four trucks per minute during construction hours.

Response

The air quality assessment incorporated scenarios which included WestConnex component projects and other related projects for both 2023 and 2033 (refer to section 9.2.7 of the EIS). The scenarios are:

- 2023 and 2033 – 'Do minimum' (no M4-M5 Link): includes M4 Widening, M4 East, New M5 and the King Georges Road Interchange Upgrade
- 2023 – 'Do something' (with M4-M5 Link): includes M4 Widening, M4 East, New M5 and the King George Road Interchange upgrade
- 2023 – 'Do something cumulative' (with M4-M5 Link): includes M4 Widening, M4 East, New M5, M4-M5 Link, the King George Road Interchange upgrade, Sydney Gateway and Western Harbour Tunnel
- 2033 – 'Do something' (with M4-M5 Link): includes M4 Widening, M4 East, New M5, M4-M5 Link and the King George Road Interchange upgrade
- 2033 – 'Do something cumulative' (with M4-M5 Link): includes M4 Widening, M4 East, New M5, M4-M5 Link, the King George Road Interchange upgrade, Sydney Gateway, Western Harbour Tunnel, Beaches Link and F6 Extension.

The air quality assessment uses changes in background air quality over time (which included emissions from Sydney Airport, associated flight paths and the White Bay cruise ship terminal), plus surface traffic flows and emissions from ventilation outlets as key contributors to changes in air quality within and around the project footprint. The assessment presents each of the pollutants in the air quality assessment and identifies the key sensitive community receptors to which more detailed time series air quality analysis was applied. These 40 sensitive community receptors (including St Peters Public School (CR35) and St Peters Community Pre-school (CR30)) were included in the 86,375 residential, workplace and recreational receptors which were locations modelled to measure any change in air quality across the modelled network. **Table C9-5** and the sections below summarise the key findings of the assessment for the 'Do something' and 'Do something cumulative' scenarios as compared with the 'Do minimum' scenario (ie without the project).

Table C9-5 Cumulative operational air quality impacts (2023 and 2033)

Pollutant	Outcomes of the operational cumulative assessment
Carbon monoxide (CO) 1hour concentration	The one-hour CO criterion for NSW was not exceeded at any of the sensitive receptors in any scenario.
NO_2 annual mean	The annual mean NO_2 criterion for NSW of 62 µg/m^3 was not exceeded at any of the sensitive receptors in the cumulative scenario. Only around 0.1 per cent of receptors were predicted to have an increase of greater than 2 µg/m^3 compared to the 'Do minimum' scenario and there was a reduction in annual mean NO_2 at between or around 80 per cent and 85 per cent of receptors, providing a benefit to the majority of receptors.
NO_2 maximum 1 hour mean	The maximum one-hour mean NO_2 concentration was predicted to be exceeded by 3.8 per cent of the sensitive receptors in 2023 and less than 1.0 per cent in the 2033 cumulative scenarios. These are compared to the 'do minimum' scenario where 6.6 per cent of the sensitive receptors were predicted to experience an exceedance in 2023 and 2.3 per cent in 2033.
Particulate matter (PM_{10} annual mean)	The concentration at the majority of receptors for the cumulative scenarios was below 20 µg/m^3, with only a very small proportion of receptors having a concentration exceeding the criterion of 25 µg/m^3. The 2023 'Do something' scenario predicted maximum was 26.5 µg/m^3 while the cumulative 2023 scenario maximum was marginally less at 25.9 µg/m^3. For the 2033 'Do something' scenario, the predicted maximum was 26.1 µg/m^3 while for the 2033 'Do something cumulative' scenarios, the maximum was marginally less at 25.8 µg/m^3. At most receptors the change for the 'Do something' and cumulative scenarios relative to the 'Do minimum' scenarios was less than two µg/m^3, and at all receptors it was less than four µg/m^3.
Particulate matter (PM_{10} 24 hour mean)	The predicted results for the cumulative scenarios were significantly influenced by the high PM_{10} background concentration of about 93 per cent of the criterion for 2023 and 2033. PM_{10} 24 hour mean concentrations at the majority of sensitive receptors was above the NSW impact assessment criterion of 50 µg/m^3 both with and without the project. Total maximum concentrations at sensitive receptors for 2023 'Do something cumulative' scenarios is 80.91 µg/m^3 and for 2033 is 81.83 µg/m^3. The predicted cumulative scenarios are between 2 µg/m^3 to 5 µg/m^{3}below that of the 'Do something' scenarios' for the same years.
Particulate matter ($PM_{2.5}$ annual mean)	Similarly to the PM_{10} criterion, the $PM_{2.5}$ background concentration is already very high and at most receptors is close to the NSW criterion of 8 µg/m^3. For the 2023 'Do something cumulative' scenarios there is a maximum increase compared to the 'Do minimum' scenario of 2.2 µg/m^3 and 1.2 µg/m^3 for the 2023 'Do something' scenario. For the 2033 'Do something cumulative' scenarios there is a maximum increase of 2.3 µg/m^3 compared to 1.4 µg/m^3 for the 2033 'Do something' scenario. The largest decreases in $PM_{2.5}$ annual mean concentrations is similar for the 'Do something' scenario and 'Do something cumulative' scenarios for both 2023 and 2033.
Particulate matter (24 hour mean $PM_{2.5}$)	Similar to 24 hour mean PM_{10}, as a result of the high background levels, the concentrations predicted at all receptors was above the NSW impact assessment criterion of 25 µg/m^3 for 24 hour mean $PM_{2.5}$ concentrations. Again with the cumulative scenarios predicting marginally lower concentrations than the 'Do something' scenario for the same year.

Organic compounds (air toxics)

Four air pollutants; benzene, PAHs, formaldehyde and 1,3-butadiene, were assessed. These compounds were taken to be representative of the much wider range of air pollutants associated with motor vehicles, and they have commonly been used for assessment of road projects. These changes took into account emissions from both surface roads and tunnel ventilation outlets.

The findings of the air quality assessment identified an increase in each of the pollutants. The resulting concentration for the cumulative scenario is however, well below the NSW impact assessment criteria.

Regional air quality

The changes in the total emissions resulting from the project show minimal change between the 'Do minimum', 'Do something' and 'Do something cumulative' scenarios and all are significantly lower than the 'Base Year (2015)' emissions without any of the projects assessed in the 'Do something' and 'Do something cumulative' in operation. For example:

- The increases in the oxides of nitrogen (NO_X) emissions for the assessed road network in a given year ranged from 71 to 174 tonnes per year. These values equate to a very small proportion (around 0.3 per cent) of anthropogenic NO_X emissions in the Sydney airshed in 2016 (around 53,700 tonnes)
- These increases in NO_X in a given year are much smaller than the projected reductions in emissions between the base year (2015) and 2033 (around 2,340 tonnes per year)
- Changes to ground level ozone are below the screening impact level for ozone as described in the NSW ozone assessment tool[13].

C9.20.2 Air quality impacts from a cumulative increase in traffic

Submitters expressed concern that air quality would be impacted and pollution levels increased due to increased traffic across Sydney from the other WestConnex component projects and the M4-M5 Link. Concerns include the development of numerous entry and exit ramps.

Response

Air quality in the Sydney region has improved over the last few decades. The improvements have been attributed to initiatives to reduce emissions from industry, motor vehicles, businesses and residences. Levels of NO_2, SO_2 and CO continue to be below national standards, levels of ozone and particles (PM_{10} and $PM_{2.5}$) still exceed the standards on occasion.

The changes to air quality predicted in the EIS, would be in addition to some substantially larger underlying reductions in emissions from the traffic on the network. Between 2015 and 2023 the total emissions of CO, NO_X and total hydrocarbons from the traffic on the road network are predicted to decrease by about 40 per cent. Between 2015 and 2033 the reductions are between around 50 per cent and 60 per cent. For PM_{10} and $PM_{2.5}$, the underlying reductions are smaller: around six to nine per cent for PM_{10} and 17 to 19 per cent for $PM_{2.5}$. This is because there is currently no anticipated regulation of non-exhaust particles, which form a substantial fraction of the total. In the case of PM_{10}, the underlying reductions in emissions are similar to the increases associated with the project, whereas for $PM_{2.5}$ the underlying reductions are larger than the increases due to the project.

Overall, it is concluded that the regional impacts of the project would be negligible, and undetectable in ambient air quality measurements at background locations.

[13] NSW EPA Tiered Procedure for Estimating Ground Level Ozone Impacts from Stationary Sources (ENVIRON 2011)

C10 Noise and vibration

This chapter addresses issues raised in community submissions associated with the noise and vibration assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 10 (Noise and vibration) and Appendix J (Technical working paper: Noise and vibration) of the EIS for the further detail on the noise and vibration assessment.

Contents

C10.1 Level and quality of the noise and vibration assessment (general)

432 submitters raised concerns about the level and quality of the noise and vibration assessment (not specific). Refer to Chapter 10 (Noise and vibration) of the EIS and Appendix J (Technical working paper: Noise and vibration) of the EIS for details of the noise and vibration assessment for the project.

C10.1.1 Adequacy of assessment

Submitters have raised concerns that general noise and vibration impacts (not specific to construction or operation) had not been adequately assessed, including:

- The EIS does not adequately assess the impact of aircraft noise and its cumulative impact
- Objection to the poor analysis of both the long and short term impacts of increased noise resulting from the project
- Concerns that impacts have not been captured accurately as no noise baseline testing was undertaken
- That further assessment of vibration impacts where the project's tunnels are shallow must be conducted
- The details on location and operating times of noise and vibration monitoring stations are not provided or that it is unclear when and where measured noise levels were recorded
- Concern that noise measurements in the EIS are out of date and were taken before the removal of trees and buildings or does not consider the removal of them
- Concern that what is presented in the EIS is not an accurate synthesis of how noise and vibration issues can best be managed given the experience of residents at Haberfield living with the ongoing impacts of the M4 East project
- The EIS does not outline the level of uncertainty in the estimation of noise and vibration impacts on people or buildings
- Concern that there are inconsistencies in the presented predicted noise levels in the EIS
- The EIS fails to advise what the noise and vibration impact of the access tunnel from the Darley Road civil and tunnel site will be on residents both during construction and operation
- The EIS should have presented noise and vibration impact information in a format which allows residents to see the impact to them or their neighbourhood specifically
- The EIS provides no justification for not addressing construction noise at properties greater than single storey
- The EIS appears to use estimates and assumption instead of empirical evidence when assessing noise and vibrations impacts It was unclear when measured noise levels were recorded for the Haberfield, Ashfield and St Peters areas. Where new measurements taken for this EIS or are the background measurements that are referred to measures taken for the M4-M5 and M5, prior to demolition of the built environment and removal of vegetation? If the measures relied on for this EIS include those taken several years ago, then there needs to a review and re-assessment of the baseline measures obtained, so that modelling can be based on the current environment of sound dispersal.

Response

Table C10-1 Response to general noise and vibration assessment methodology concerns

Concern or query	Response
The EIS does not adequately assess the impact of aircraft noise and its cumulative impact	Aircraft noise and impacts associated with any future developments of Sydney Airport would be addressed and managed the governing authority of the airport. Noise monitoring was undertaken as part of baseline studies for the EIS between July 2016 and November 2016. The results of this monitoring was described in terms of the maximum sound pressure level (L_{Amax}) (e.g. aircraft flyovers), energy equivalent sound pressure (L_{Aeq}) (e.g. ambient road traffic noise) and the sound pressure level that was exceeded for 90 percent of the time (L_{A90}). The latter, L_{A90}, represents the background noise level when the noise environment is least affected by intermittent road traffic noise and maximum noise level events caused by aircraft flyovers. This background noise level is used to establish construction noise management levels. Noise from construction is described as the energy equivalent sound pressure level, denoted as $L_{Aeq(15minute)}$, and assessed in accordance with NSW Environment Protection Authority's (EPA) *Interim Construction Noise Guideline* (ICNG) (NSW Department of Environment and Climate Change (DECC) (2009). This guideline does not require other extraneous noise sources to be assessed against the construction noise management levels. Where aircraft flyover occurs simultaneously with construction, the lower of the two noise levels would generally be masked by the other.
Objection to the poor analysis of both the long and short term impacts of increased noise resulting from the project	The noise and vibration assessment addressed the relevant key impacts likely to occur as a result of the construction and operation of the project. Long and short term impacts have been assessed in the noise and vibration assessment which has considered specific construction activities over the estimated construction program for each construction ancillary, as well as considering noise and vibration impacts from the operation of the project. This took into account the existing baseline noise scenario, as well as noise and vibration modelling completed for the concept design of the project. The assessment addressed likely potential cumulative effects and construction fatigue, particularly in areas subject to construction impacts from the M4-M5 Link project as well as either the M4 East or the New M5. Feedback received on the M4 East and New M5 EISs and issues raised by the community during the construction stages of these projects to date were also considered. The EIS, including all detailed technical studies, was reviewed by the NSW Department of Planning and Environment (DP&E) and key agencies to confirm that it adequately addressed the Secretary's Environmental Assessment Requirements (SEARs) prior to being placed on public exhibition.
Concerns that impacts have not been captured accurately as no noise baseline testing was undertaken	Background noise monitoring was undertaken between July and November 2016. The location of the noise loggers deployed for the noise monitoring survey are outlined in Table 3-2 of Appendix J (Technical working paper: Noise and vibration) of the EIS. This includes the location of all 34 loggers, the dates they were deployed and the purpose for their deployment (ie establish background levels, validate the noise model, spot checks or maximum noise measurements). This background noise monitoring was supplemented with data collected on behalf of the M4 East and New M5 projects. These measurements are considered to be representative of the existing background noise within the study area.

Concern or query	Response
The details on location and operating times of noise and vibration monitoring stations are not provided or that it is unclear when and where measured noise levels were recorded	Noise monitoring locations and the dates they were active are outlined in section 3.4 Appendix J (Technical working paper: Noise and Vibration) of the EIS. Noise loggers at these locations were active 24 hours a day during these periods. No vibration baseline monitoring was undertaken. The vibration impact assessment has assumed that all potentially affected project areas are not currently subject to any vibration, even though some vibration particularly around busy roads may be currently evident.
Concern that noise measurements in the EIS are out of date and were taken before the removal of trees and buildings or does not consider the removal of them	While the noise modelling and subsequent impact assessment were prepared prior to the commencement of any demolition or construction for the project, the modelling does account for the removal of buildings where this would then remove noise shielding for subsequent rows of sensitive receivers. The modelling does not account for the removal of vegetation, as vegetation typically provides very little noise attenuation. Further to this, the noise model included three-dimensional modelling of all buildings and other significant structures such as existing noise walls (refer to section 4.2.1 of Appendix J (Technical working paper: Noise and vibration) of the EIS for further information) . Noise modelling for the impact assessment was undertaken on the basis of the removal of these structures in accordance with construction management plans. On this basis the degree of uncertainty in the noise model is considered to be low and the impacts predicted are considered to be an accurate representation of the likely worst case impacts of the concept plan as proposed.
Concern that what is presented in the EIS is not an accurate synthesis of how noise and vibration issues can best be managed given the experience of residents at Haberfield living with the ongoing impacts of the M4 East project	Appendix J (Technical working paper: Noise and vibration) of the EIS includes specific discussion of the consecutive construction noise impacts for sensitive receivers in the vicinity of the M4 East construction facilities at Haberfield and Ashfield. The noise and vibration assessment considered a range of management measures for implementation during construction to eliminate, reduce and/or manage noise impacts. These include the use of construction hoarding around all ancillary facilities, as well restrictions on heavy vehicle movements during certain times of the day at certain sites. In addition to this a Utilities Management Strategy (refer to Appendix F (Utilities Management Strategy) of the EIS) has also been prepared so as to better coordinate utility works and reduce the incidence of unnecessary noise impacts to residents already affected by construction noise. The project would be subject to detailed design and construction planning and further noise and vibration assessment would be undertaken during the detailed design stage. The mitigation and management measures prepared at this stage would aim to manage noise impacts upon residents (including residents in Haberfield) as far as is reasonable. See **section B11.11.3** for further information regarding ongoing construction impacts at Haberfield for the project.
The EIS does not outline the level of uncertainty in the estimation of noise and vibration impacts on people or buildings	It is expected that the construction noise levels would frequently be lower than the predictions since levels are conservatively predicted assuming a worst case operating scenario. For example, concrete saw and rockbreaking are modelled assuming that the operator would perform the task without interruption throughout a 15-minute assessment time period, which is unlikely in practice (refer to section 4.2.1 of Appendix J (Technical working paper: Noise and vibration) of the EIS for further information). The modelling methodology employed for the project has been widely used on a range of large infrastructure projects throughout Australia and globally. The predictions provided are generally considered to be representative of actual noise impacts. As such the degree of uncertainty is typically very low.

Concern or query	Response
Concern that there are inconsistencies in the presented predicted noise levels in the EIS	The project team is not aware of inconsistencies in the predicted noise levels in the EIS and would welcome any efforts to highlight these.
The EIS fails to advise what the noise and vibration impact of the access tunnel from the Darley Road civil and tunnel site will be on residents both during construction and operation	Appendix J (Technical working paper: Noise and vibration) of the EIS includes specific discussion of the likely noise impacts at Darley Road civil and tunnel site (C4). This includes the establishment of the site and excavation for the purposes of constructing the access tunnel at this location. As soon as is practical the entry to the access tunnel is proposed to be covered with an acoustic shed so as to minimise noise impacts upon nearby residents and businesses. The access tunnel would only be used during the construction of the project.
The EIS should have presented noise and vibration impact information in a format which allows residents to see the impact to them or their neighbourhood specifically	Appendix J (Technical working paper: Noise and vibration) of the EIS and associated annexures provides detailed figures, charts and maps outlining the noise impact which correspond to the locations of proposed construction ancillary facilities, where impacts are predicted. This includes the analysis of 55 noise catchment areas (NCA) in order to provide the characterisation of noise impact at a neighbourhood level. This is an accepted methodology for communicating noise and vibration impacts.
The EIS provides no justification for not addressing construction noise at properties greater than single storey	The noise and vibration assessment does not suggest that construction noise mitigation measures should be limited according to which floor affected properties are on. The majority of mitigation and management measures proposed, such as construction hours and scheduling, the selection of low noise equipment and the use of respite periods would apply equally to all receivers at any height within a building.
The EIS appears to use estimates and assumption instead of empirical evidence when assessing the impact on properties as a result of vibration impacts from tunnels	Potential vibration impacts during construction, including for the construction of the tunnels for the project, are assessed in section 10.3 of the EIS. The minimum working distances for vibration intensive equipment have been provided based upon details in NSW Roads and Maritime Services (Roads and Maritime) *Construction Noise and Vibration Guideline* (CNVG), DIN 4150: *Part 3-1999 Structural vibration – Effects of vibration on structures* (DIN 4150) (Deutsches Institut für Normung 1999). and measurements undertaken by SLR Consulting. These distances are either empirically derived or are industry accepted estimates that have been utilised in a large number of previous infrastructure projects. As such these values are considered to be credible and applicable to the project.
That further assessment of vibration impacts where the project's tunnels are shallow must be conducted	Vibration impacts were assessed for various locations in Chapter 5 of Appendix J (Technical working paper: Noise and vibration) of the EIS). This assessment included consideration of potential impacts from tunnelling activities as they pass under sensitive receivers. Specific discussion has been included on proposed areas of shallow tunnelling and its potential impact. Further assessment of potential vibration impacts associated with shallow tunnelling would be undertaken once a detailed design is available. This would further outline likely impacts and form the basis of consultation with affected residents and businesses.

Concern or query	Response
It was unclear when measured noise levels were recorded for the Haberfield, Ashfield and St Peters areas. Where new measurements taken for this EIS or are the background measurements that are referred to measures taken for the M4-M5 and M5, prior to demolition of the built environment and removal of vegetation? If the measures relied on for this EIS include those taken several years ago, then there needs to a review and re-assessment of the baseline measures obtained, so that modelling can be based on the current environment of sound dispersal	Background noise measurements of the Ashfield, Haberfield and St Peters areas were taken prior to the commencement of the M4 East or New M5 projects. This was necessary to avoid including construction noise in the background noise levels as doing so would falsely inflate the background and lead to a less conservative assessment i.e. potential exceedances would be less than when compared to the typical lower noise environment when construction was not active. As such, these measurements were taken prior to the demolition of pre-existing vegetation, buildings and other infrastructure. As outlined above, it was not possible to take new measurements of background noise in this area due to the presence of construction activities. To undertake representative noise sampling would have required the long term pausing of construction and construction traffic for the M4 East and New M5, which was not practical. Even if this did occur, the background noise levels would not be representative due to changes in traffic patterns in response to construction that has already taken place (both positively and negatively).

C10.2 Level and quality of the construction noise and vibration assessment

861 submitters raised concerns about the level and quality of the construction noise and vibration assessment. Refer to section 10.1 and Appendix J (Technical working paper: Noise and vibration) of the EIS for details of the noise and vibration assessment methodology.

C10.2.1 Adequacy of assessment

Submitters have raised concerns that the noise and vibration impacts during construction had not been adequately assessed, including:

- General concerns that the potential noise and vibration impacts had not been properly assessed, or that the scope of the assessment was too limited
- That there is insufficient information on numbers and locations of equipment to assess the noise impacts of concurrent activities or when, where and how noise level data was recorded
- Request for an independent noise and vibration study of the Darley Road civil and tunnel site to be undertaken
- The EIS does not adequately address the cumulative impact of prolonged noise exposure from construction which in some areas may extend for over a decade
- Based on previous experience of existing WestConnex construction sites, the noise modelling is likely to have underestimated the duration for utility works
- Critical of finding that there will be no noise exceedances at Campbell Road at St Peters given that noise levels experienced during construction of the New M5 are already high

- Concern that the noise study has been based on impacts already being experienced by residents in areas with ongoing construction and that changes in levels due to the project are reported as less significant than if there was no current existing construction noise
- Critical of the noise assessment around the Rozelle Rail Yards given residents have already experienced significant noise from site management activities and the area will see a marked increase in noise from heavy vehicle movements and these issues have not been adequately dealt with in the EIS
- That possible future design changes will change the properties requiring treatment against construction noise and that these are not detailed in the EIS
- No analysis of the magnitude of increased noise pollution for local residents near the Iron Cove Link civil site has been included in the EIS
- That the EIS appears to have assessed the impacts of each work site in isolation without considering how noise and vibration adds together for residents located between several project work sites
- Concern that the cumulative impacts of aircraft noise have not been taken into account in the construction noise impact assessment
- Concern over the use of the “noise management level” in the EIS which is inconsistent with NSW EPA policy and does not include a weighting for the character of the emitted noise and therefore impacts from construction activities may be understated
- Concern over the claim made in the EIS that internal noise levels are reduced by 10 dBA (A-weighted decibels) with a window being open as experience shows that this cannot be met in practice
- Concerns that the number of residents affected by construction noise has been significantly underestimated or that the impacts of construction noise have been underestimated
- The effects on continual construction noise have not been adequately addressed in the EIS
- The lived impacts from residents near the M4 East project has shown that the modelled impacts of construction noise were flawed and therefore an accurate assessment needs to be ensured for the M4-M5 Link
- The need for re-measurement and re-analysis of potential construction noise impacts after the demolition of buildings and removal of vegetation and concern that the assessment of construction noise did not consider the removal of some buildings or vegetation
- The EIS states there would be noise exceedances from heavy vehicles entering and exiting the Pyrmont Bridge Road site but does not provide any detail as to the level of exceedance
- The EIS only mentions morbidity for over 30 year olds and so does not adequately assess the impacts of construction noise and vibration on children attending schools near construction work
- Concern that information regarding noise mitigation measures at the Darley Road civil site (C4) was insufficient therefore the noise impacts cannot be properly assessed
- Limited information regarding the mitigation of noise impacts at the Pyrmont Bridge Road site
- Believes that based on the acoustics of the James Street end of Darley Road, the level of noise exceedance noted in the EIS is understated and no mitigation strategy is provided
- Engine noise has not been acknowledged or assessed in the EIS at Darley Road
- Submitter raised concerns regarding the lack of analysis provided in the EIS regarding the magnitude of increased noise pollution for the Rozelle interchange construction.

Response

Table C10-2 Response to construction specific noise and vibration assessment methodology concerns

Concern or query	Response
General concerns that the potential noise and vibration impacts had not been properly assessed, or that the scope of the assessment was too limited	The EIS was prepared by a team of qualified professionals and presents a balanced, merit-based environmental impact assessment in accordance with the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) and applicable NSW assessment policies. The noise and vibration assessment for the EIS (refer to Appendix J (Technical working paper: Noise and vibration) of the EIS) was prepared in accordance with the SEARs, which included requirements issued by key government agencies as well as industry standards and guidelines. Relevant guidelines include the CNVG and the *Interim Construction Noise Guideline* (ICNG) (DECC 2009a) and the *NSW Road Noise Policy* (RNP) (NSW Department of Environment, Climate Change and Water (DECCW) 2011). Collectively these guidelines provide a robust framework for assessing noise and vibration impacts to ensure these assessments are carried out consistently, to a high standard, and are properly integrated with other environmental assessments, design development and management processes. The scope of the assessment is comparable to construction noise assessments carried out for other major infrastructure projects. The assessment has considered feedback received regarding construction impacts for the M4 East and New M5 projects (see **section C2.1.8** for further information).
That there is insufficient information on numbers and locations of equipment to assess the noise impacts of concurrent activities or when where and how noise level data was recorded	Background noise monitoring data used to inform the noise impact assessment in the EIS was obtained at locations identified as providing a reasonable and representative characterisation of the background noise environment of the receivers most likely to be affected by noise from the project. Noise monitoring locations were chosen according to relevant guidelines and the extent of the project footprint. Noise monitoring equipment was deployed with consideration of other noise sources that may influence the measurements, accessibility and security, and with the consent of relevant landowners. The location of the noise loggers deployed for the noise monitoring survey are outlined in Table 3-2 of Appendix J (Technical working paper: Noise and vibration) of the EIS. This includes the location of all 34 loggers, the dates they were deployed and the purpose for their deployment (to establish background levels, to validate the noise model, spot checks or maximum noise measurements). Locations where construction work had already commenced on the M4 East or New M5 were not monitored as it was recognised that this construction work would falsely inflate the normal background noise levels. For these locations, background monitoring data collected on behalf of the M4 East and New M5 projects was used instead. This data is considered to be representative of the existing background noise levels within the study area prior to the commencement of any project works and also allows for consistent noise management levels to established with the other stages of the WestConnex project and allows for consistent construction. With respect to monitoring noise from concurrent activities during construction, this would be undertaken according to the Construction Noise and Vibration Management Plan (CNVMP). The number and locations of monitoring devices would be consulted on with DP&E and the NSW EPA prior to deployment. These locations would be selected so as to best represent the typical noise emitted during construction.

Concern or query	Response
Request for an independent noise and vibration study of the Darley Road civil and tunnel site to be undertaken	The noise assessment undertaken for the Darley Road civil and tunnel site (C4), and the remainder of the project, has been prepared according to the SEARs and all relevant noise and vibration guidelines. As such the assessment is considered to accurately identify the predicted worst case noise impacts on the basis of the level of project detail available at the concept design stage. Should the project be approved, these predictions would be revisited once a detailed design is prepared and mitigation measures would be applied or adjusted accordingly. Noise monitoring would also be undertaken during construction to confirm that actual noise levels are consistent with the predictions and that appropriate mitigation measures are being implemented. It is proposed that a suitably qualified and experienced Acoustics Advisor, who is independent of the design and construction contractor(s), will be engaged for the duration of construction. The Acoustics Advisor would carry out a range of tasks, including, but not limited to: • Review noise and vibration documents prepared for the project • Regularly monitor the implementation of noise and vibration management measures • Consider and recommend improvements that may be made to work practices to avoid or minimise adverse noise and vibration impacts.
The EIS does not adequately address the cumulative impact of prolonged noise exposure from construction which in some areas may extend for over a decade	Construction scenarios were used to assess cumulative construction noise which would occur as a result of project construction activities occurring simultaneously and due to another project being constructed near the project. These scenarios and their durations were developed by the proponent's specialist constructability advisor and are considered to accurately represent the likely real-world construction scenario. The construction durations shown for each work activity include some activities which extend for relatively long durations over the construction phase. However, in practice, noise generating activities from above ground construction works generally move around the site which would result in the worst case impacts at any given receiver being of far shorter duration. The M4-M5 Link would overlap with other projects in some areas, including at Haberfield/Ashfield, Rozelle and St Peters and there is likely to be an extended duration of construction works at these locations. This is considered and assessed in section 26.3 and section 26.4 of the EIS. Submissions relating to cumulative construction noise have been responded to in **section C10.14**. See **section B11.11.3** for further information regarding ongoing construction impacts at Haberfield and St Peters for the project.
Based on previous experience of existing WestConnex construction sites, the noise modelling is likely to have underestimated the duration for utility works	Specific efforts have been made during the preparation of the EIS and the Noise and vibration impact assessment to characterise the duration, character and extent of utility works. This is despite many of these works falling under the control of individual utility organisations and being outside the control of the proponent. A Utilities Management Strategy has been prepared to outline the likely utility works that would be required to facilitate the M4-M5 Link Project and to assess the potential impacts associated with these utility works. In doing so the proponent has sought to characterise the duration of utility works as accurately as possible. This is based upon recent experience with the M4 East and New M5 projects and also allows a degree of contingency to allow for unexpected issues being encountered.

Concern or query	Response
Critical of finding that there will be no noise exceedances at Campbell Road at St Peters given that noise levels experienced during construction of the New M5 are already high	The construction site for the M4-M5 Link at St Peters is substantially smaller in area than the New M5 construction site, with a commensurate reduction in relative noise emissions. In addition, certain elements of the M4-M5 Link project in this location, such as the ventilation facility, are being largely constructed as part of the New M5 project, reducing the amount of noise. Further to this no major utility works or surface road works are proposed for M4-M5 Link project in this location.
Concern that the noise study has been based on impacts already being experienced by residents in areas with ongoing construction and that changes in levels due to the project are reported as less significant than if there was no current existing construction noise	The noise and vibration impact assessment has been undertaken based upon ambient noise monitoring. For the majority of the project area this data was collected via the placement of noise loggers between July and November 2016. It was noted that the elevated noise environment resulting from the construction operations at Haberfield (M4 East) and St Peters (New M5) would have skewed the results had loggers been placed in these locations. As such noise loggers were not placed here and baseline monitoring data for these locations from the M4 East and New M5 projects was used instead. The monitoring data is considered to be adequate and representative of the baseline under a 'No-construction' scenario.
Critical of the noise assessment around the Rozelle Rail Yards given residents have already experienced significant noise from site management activities and the area will see a marked increase in noise from heavy vehicle movements and these issues have not been adequately dealt with in the EIS	Potential noise impacts around the Rozelle Rail Yards for the project are assessed in section 3.3 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Potential noise impacts from heavy vehicle movements are assessed in section 5.3.3 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Noise and vibration arising from the Rozelle Site Management Works has been assessed separately. These works have been excluded from the cumulative noise and vibration scenarios within the EIS as they are due to be completed by mid-2018 and as such would not be expected to overlap with the construction of the M4-M5 Link. The potential for consecutive construction impacts has been considered and discussed in Appendix J (Technical working paper: Noise and vibration) of the EIS. In situations where consecutive long term construction noise impacts occur, at-property noise mitigation may be considered where feasible and reasonable, if options for at source noise mitigation and management measures have been exhausted. The requirement for this would be evaluated in consultation with Roads and Maritime and the community during detailed design, and would be considered when preparing the site specific construction noise and vibration impact statements (CNVISs). Feasible and reasonable considerations for providing at receiver treatments should include: • Time of day of the impacts and exceedance of criteria • Time of impacts at the affected receivers • How long the mitigation will provide benefit to the receiver during the project • Optimal design of acoustic sheds, noise barriers/hoarding and management measures to reduce the impacts as far as practicable.

Concern or query	Response
That possible future design changes will change the properties requiring treatment against construction noise and that these are not detailed in the EIS	Issues regarding the assessment of a concept design are addressed in **section C2.1.2**. The detailed design will be prepared based on the approved project as described in the EIS and the Submissions and preferred infrastructure report and will be consistent with the conditions of approval and any other requirements of DP&E. Where the detailed design is inconsistent with the approved project, further assessment and approval would be required under the EP&A Act. If further assessment/approval is required due to project design changes, the applicable statutory process will be followed prior to commencement of construction of the relevant aspect of the project. This may be in the form of a modification request lodged with DP&E, depending on the scale of the proposed modification and the potential for environmental or social impacts.
No analysis of the magnitude of increased noise pollution for local residents near the Iron Cove Link civil site has been included in the EIS	The assessment of noise and vibration impacts during construction has been undertaken across all relevant parts of the site where construction activity is proposed, including an assessment of increases in road traffic noise from construction traffic. This includes full assessment of impacts around the Iron Cove Link civil site, including an outline of the potential impacts upon residential properties in this area. Refer to section 5.4 of Appendix J (Technical working paper: Noise and vibration) of the EIS.
That the EIS appears to have assessed the impacts of each work site in isolation without considering how noise and vibration adds together for residents located between several project work sites	Noise and vibration impacts from adjacent construction sites would not extend far enough from each site that they would overlap. As such there is no need to address this within the EIS.
Concern that the cumulative impacts of aircraft noise have not been taken into account in the construction noise impact assessment	Aircraft noise and impacts associated with any future developments of Sydney Airport would be addressed and managed by the airports governing authority. Whilst noise from aircraft fly overs is recognised as a feature of the local ambient noise environment, the assessment of impacts from aircrafts fly overs is not required to be assessed, as this project is a road infrastructure project only.
Concern over the use of the 'noise management level' in the EIS which is inconsistent with NSW EPA policy and does not include a weighting for the character of the emitted noise and therefore impacts from construction activities may be understated	The noise and vibration assessment for the EIS (refer to Appendix J (Technical working paper: Noise and vibration) of the EIS) was prepared in accordance with the SEARs, which included requirements issued by key government agencies as well as industry standards and guidelines. Relevant guidelines include the CNVG, ICNG and the RNP. Collectively these guidelines provide a robust framework for assessing noise and vibration impacts to ensure these assessments are carried out consistently, to a high standard, and are properly integrated with other environmental assessments, design development and management processes. The ICNG requires project specific Noise Management Levels (NMLs) to be established for noise affected receivers. The potential for tonal construction noise to be generated by activities such as rock-breaking is identified in section 10.1.3 of the EIS. Specific management measures, such as the use of respite periods, have been proposed to account for these activities.

Concern or query	Response
Concern over the claim made in the EIS that internal noise levels are reduced by 10 dBA with a window being open as experience shows that this cannot be met in practice	The attenuation of external noise provided by a building varies depending upon the nature of the building fabric, as well as factors such as having windows open. In the EIS a value of 10 dBA has been used as a standard attenuation factor when setting internal NMLs relevant for 'other sensitive receivers', such as schools, hospitals, places of worship, and outdoor recreation areas. This has been based upon achieving an internal NML of 45 dBA for schools and places of worship. The use of a 10 dBA attenuation factor is considered to be appropriate to the type of building construction used in schools and places of worship and is in line with the recommendation for the conversion of internal to external noise levels from the NSW EPA and World Health Organization.
Concerns that the number of residents affected by construction noise has been significantly underestimated or that the impacts of construction noise have been underestimated	A number of construction scenarios were developed to assess the likely impacts associated with the project. These scenarios were used to group a number of similar construction activities and included an outline of the equipment to be used and their locations. Consistent with the requirements of the ICNG, the assessment provided a 'realistic worst case' noise impact assessment for construction scenarios based on proposed works within a 15-minute period. These scenarios may change during detailed design when additional information regarding construction activities and staging is available, however the 'realistic worst case' scenario considered for the noise impact assessment for construction allows for flexibility in the detailed design process as modelled impacts in the EIS will likely be greater than the actual impacts during construction. On this basis the number of residents likely to be affected by construction noise is likely to be conservative. Impacts associated with the final detailed design are likely to be lower than those outlined in the EIS on the basis that the project would have been subject to design refinements and equipment and program specifications that lower the overall impact. The nature and scope of mitigation and management measures would also have been finalised as part of the CNVMP by this stage, which would further reduce the overall level of noise impact.
The effects on continual construction noise have not been adequately addressed in the EIS	The noise and vibration assessment addressed the relevant key impacts likely to occur as a result of the construction of the project. The assessment addressed likely potential cumulative effects and construction fatigue, particularly in areas subject to extended construction impacts from the M4-M5 Link project as well as either the M4 East or the New M5 projects. See section B11.11.3 for further information regarding ongoing construction impacts at Haberfield and St Peters for the project. Feedback received on the M4 East and New M5 EISs and issues raised by the community during the construction stages of these projects to date were also considered. Specific discussion of this matter is included in section 5.1.7 (Haberfield) and 5.6.2 (St Peters) of Appendix J (Technical working paper: Noise and vibration) of the EIS.
The lived impacts from residents near the M4 East project has shown that the modelled impacts of construction noise were flawed and therefore an accurate assessment needs to be ensured for the M4-M5 Link	The project team is confident that the EIS provides an accurate characterisation of the noise impacts that would be associated with the project. As outlined above, the project description and program would be further refined at the detailed design stage and would be subject to further modelling at that time. These predictions would be subject to verification measurements of actual construction noise upon commencement. Noise monitoring would be carried out to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions in the EIS and that the management measures that have been implemented are appropriate. This allows for predictions to be revised and additional environmental management measures to be implemented as required.

Concern or query	Response
The need for re-measurement and re-analysis of potential construction noise impacts after the demolition of buildings and removal of vegetation and concern that the assessment of construction noise did not consider the removal of some buildings or vegetation	The noise modelling and subsequent impact assessment were prepared prior to the commencement of any demolition or construction for the project. The modelling does however account for the removal of buildings where this would then remove noise shielding for subsequent rows of sensitive receivers. The modelling does not account for the removal of vegetation, as vegetation typically provides very little noise attenuation unless it is of substantial depth (less than 20 metres). Hence, the anticipated removal of vegetation within the project footprint (all of which is less than 20 metres in depth) would not materially affect the predicted sound levels. Noise monitoring would be carried out to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions in the EIS and that the management measures that have been implemented are appropriate. This allows for predictions to be revised and additional environmental management measures to be implemented as required.
The EIS states there would be noise exceedances from heavy vehicles entering and exiting the Pyrmont Bridge Road site but does not provide any detail as to the level of exceedance	The noise impact associated with heavy vehicles entering and exiting the Pyrmont Bridge Road construction site has been assessed as part of scenario PYR-11 in Appendix J (Technical working paper: Noise and vibration) of the EIS. This assessment identified exceedances of up to 5 dBA during night-time works, affecting up to three sensitive receivers. This same activity was identified as affecting up to 14 residential receivers for the sleep disturbance threshold. Construction road traffic noise on the road network around Pyrmont Bridge Road is assessed in section 5.5.3 of Appendix J (Technical working paper: Noise and vibration) of the EIS. The assessment indicates that construction traffic is unlikely to result in a noticeable increase in LAeq noise levels at receivers along the proposed routes. With regard to potential night-time maximum noise events, construction traffic on the major roads are unlikely to significantly increase the number of maximum noise events due to the relatively high existing traffic volumes on these roads.
The EIS only mentions morbidity for over 30 year olds and so does not adequately assess the impacts of construction noise and vibration on children attending schools near construction work	The noise and vibration assessment was reviewed to determine if the predicted impacts had the potential to affect the health of the surrounding community. Potential noise impacts were assessed against relevant NSW criteria with regard to annoyance and, in the case of night-time criteria, sleep disturbance. Where the guidelines could not be met, it was determined that these activities had the potential for adverse community health effects. Submissions relating to human health impacts from construction noise and vibration have been responded to in section C11.4. Haberfield Public School is located within NCA07. The construction footprint associated with the Parramatta Road East civil site (C3b) is located approximately 75 metres from the nearest boundary of the school. During high noise generating activities it is predicted that the school would be subject to noise levels of up to 60 dBA, resulting in an exceedance of the NML by up to 5 dBA. As identified in Table 5-29 of Appendix J (Technical working paper: Noise and vibration) of the EIS, the key high noise generating activities would generally occur as part of site establishment, utility works, pavement/infrastructure works and the establishment of construction activities which are generally of a relatively short duration. Exceedances would only partially affect two buildings in the west of the school site for a period of up to four weeks. These exceedances would be attributable to the intermittent use of noisy plant items such as concrete saws and rockbreakers.

Concern or query	Response
	These items would not operate continuously through the construction period, with most operation being early in the program when the removal of existing concrete or excavation is required. Noisy items of plant would also move around the work site and as such the worst case predicted impacts would only occur when the plant items are in close proximity to the school. There would be no exceedances of daytime NMLs for tunnelling and supporting works, construction of ventilation facility or, site rehabilitation. Construction traffic would typically enter and exit the Parramatta Road East civil site via Parramatta Road. Construction traffic is unlikely to use local roads in and around the site, including Bland Street (on which Haberfield Public School is located). Rozelle Public School is located within NCA31. The background noise environment at this location is influenced by traffic noise from Victoria Road and Darling Street as well as aircraft noise given the school is located within in a flight path for Sydney Airport. The construction footprint associated with the Iron Cove Link civil site (C8) is located about 140 metres from the nearest boundary of Rozelle Public School. The Iron Cove Link civil site (C8) is located at a lower elevation than Rozelle Public School. During higher noise generating activities, such as during roadworks and concrete works, it is predicted that the school would be subject to up to 75 dBA noise levels, resulting in exceedances of the NML by up to 20 dBA. Generally the NML exceedances arising in this noise catchment area would be temporary and attributable to the intermittent use of noisy plant items such as concrete saws and rockbreakers. These items would not operate continuously through the construction period, with most operation being early in the program when the removal of existing concrete or excavation is required. Noisy items of plant would also move around the work site and as such the worst case predicted impacts would only occur when the plant items are in close proximity to the school. During the construction of the ventilation facility noise impacts are not predicted to exceed the NML for education facilities, or any of the ‘other sensitive receiver’ categories. This includes the nearby Rozelle Public School. The vast majority of construction traffic from the Iron Cove Link civil site would enter and exit the site along Victoria Road. Construction traffic is unlikely to use local roads in and around the site, apart from Victoria Road. The indicative site layout plan shows that the civil site is principally located along the south side of Victoria Road, the opposite side of the road to Rozelle Public School.

Concern or query	Response
Concern that information regarding noise mitigation measures at the Darley Road civil and tunnel site (C4) was insufficient therefore the noise impacts cannot be properly assessed	The noise assessment undertaken for the Darley Road civil and tunnel site (C4), and the remainder of the project, has been prepared according to the SEARs and all relevant noise and vibration guidelines. As such the assessment is considered to accurately identify the predicted worst case noise impacts on the basis of the level of project detail available at the concept design stage. Should the project be approved, these predictions would be revisited once a detailed design is prepared and mitigation measures would be applied or adjusted accordingly. Noise monitoring would also be undertaken during construction to confirm that actual noise levels are consistent with the predictions and that appropriate mitigation measures are being implemented. A range of potential mitigation measures applicable to the Darley Road civil and tunnel site (C4) have been outlined in section 7.3.1 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Given that the project is only at concept stage these mitigation measures have not been specified in detail. These would however be revisited upon preparation of a detailed design, at which time site-specific mitigation and management measures would be specified. Spoil removal from this site would only occur within standard construction hours (between 7.00 am and 6.00 pm Monday to Friday, and between 8.00 am and 1.00 pm on Saturdays) to minimise potential out-of-hours noise impacts associated with spoil haulage.
Limited information regarding the mitigation of noise impacts at the Pyrmont Bridge Road Site	The noise assessment undertaken for the Pyrmont Bridge Road tunnel site (C9), and the remainder of the project, has been prepared according to the SEARs and all relevant noise and vibration guidelines. As such the assessment is considered to accurately identify the predicted worst case noise impacts on the basis of the level of project detail available at the concept design stage. Should the project be approved, these predictions would be revisited once a detailed design is prepared and mitigation measures would be applied or adjusted accordingly. Noise monitoring would also be undertaken during construction to confirm that actual noise levels are consistent with the predictions and that appropriate mitigation measures are being implemented. A range of potential mitigation measures applicable to the Pyrmont Bridge Road tunnel site (C9) have been outlined in section 5.5.2 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Given that the project is only at concept stage these mitigation measures have not been specified in detail. These would however be revisited upon preparation of a detailed design, at which time site-specific mitigation and management measures would be specified.

Concern or query	Response
Believes that based on the acoustics of the James street end of Darley Road, the level of noise exceedance noted in the EIS is understated and no mitigation strategy is provided	The noise exceedances predicted in the EIS are based upon modelling which takes into account the existing background noise levels and the three dimensional nature of buildings and noise walls within the study area. As such the noise exceedances predicted for Darley Road are considered to be valid. It should be noted that the James Street end of Darley Road is heavily influenced by existing traffic noise from City West Link, which is immediately adjacent. All properties facing James Street are already protected from noise behind and existing noise wall (which would not be affected by construction of the project). The next property down Darley Road form this location is an industrial premises. As such the noise impact in this particular location is not expected to be substantial in relation to the exiting noise environment and the nature of receptors. Proposed mitigation measures for the Darley Road area are provided in section 5.2.2 of Appendix J (Technical working paper: Noise and vibration) of the EIS.
Engine noise has not been acknowledged or assessed in EIS at Darley Road	Noise arising from the movement of construction traffic on Darley Road has been assessed in section 5.2.3 of Appendix J (Technical working paper: Noise and vibration) of the EIS. This assessment indicates an increase in background levels of less than 0.5 dBA in the daytime and 0.6 dBA at night.
Submitter raised concerns regarding the lack of analysis provided in the EIS regarding the magnitude of increased noise pollution for the Rozelle interchange construction	Assessment of construction noise at Rozelle was included in section 5.3 of Appendix J (Technical working paper: Noise and vibration) of the EIS. This section assessed the predicted noise increase, its magnitude and nature, and provided potential mitigation measures for further consideration during the detailed design stage.

C10.2.2 Assessment of construction noise and vibration impacts at key receivers

Submitters raised concerns about the assessment of construction noise and vibration impacts at key and highly affected receivers:

- That the EIS has wrongly minimised the actual number of highly noise affected receivers adjacent to the Darley Road civil and tunnel site (C4) and does not account for the impact of heavy vehicle noise driving up or down the very steep incline between Darley Road and City West Link
- Some submitters believed due to their close proximity to the works, they should be deemed sensitive receivers when they were not in the EIS, and be subject to more detailed assessment of potential construction noise impacts
- Requests for further detail of noise impacts surrounding the Pyrmont Bridge Road tunnel site (C9) including impacts on the Malt Shovel Brewery
- The noise assessment around the Rozelle Rail Yards is inadequate, given residents have already experienced significant noise from site management works and the area will see a marked increase in noise from truck movements and these issues have not been adequately dealt with in the EIS
- Noise and vibration impacts on heritage houses within the Rozelle interchange construction zone are not specifically addressed.

Response

The number and location of sensitive noise receivers around project construction areas has been developed based upon the extent of likely noise impacts. For all construction sites this covers all known receivers that are likely to be affected by noise impacts from the project including residential, commercial and industrial properties, as well as education institutions, childcare centres, medical facilities (hospital wards or other uses including medical centres), places of worship and outdoor open areas (passive and active recreation). Receivers not identified as sensitive are not considered likely to be affected by project-related construction noise impacts.

The number and location of highly affected noise receivers around surface works areas of the project has been determined based upon the modelling of noise impacts. This is based upon industry standard techniques and utilises quantitative modelling methods which are validated and calibrated to real-world background levels in these locations prior to running the model. As such the number of highly affected noise receivers is considered to be accurate based upon the noise expected to be generated during construction (refer to section 5.2.2 and Table 5-53 of Appendix J (Technical working paper: Noise and vibration) of the EIS).

Section 5.2.3 of Appendix J (Technical working paper: Noise and vibration) of the EIS specifically assesses the noise impacts of project-related heavy and light vehicle movements at Darley Road. This assessment indicates that the equivalent continuous noise generated by these movements would be less than 0.5 dBA during the daytime. An increase of this magnitude would not be perceptible above the existing traffic noise in this location. Despite this, mitigation measures have been proposed for this location so as to reduce noise impacts. This includes the restriction of spoil haulage at this site to occur only within standard daytime construction hours.

Detail on the specific noise impacts associated with the Pyrmont Bridge Road tunnel site are outlined in section 5.5 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Further detail is provided in the Annexures to this working paper, including predicted construction noise contours for this site (refer to Annexure G of Appendix J (Technical working paper: Noise and vibration) of the EIS). These contours indicate that receivers in close proximity to the site (including the Malt Shovel Brewery) would be subject to worst case noise impacts exceeding 75 dBA during the daytime while site establishment works are undertaken (up to eight weeks duration). This would reduce in later stages of the project, with tunnelling and supporting works predicted to typically be less than 55 dBA during the daytime. It should be noted that similar evening and night time noise levels would also be expected for these sites during the various stages (refer to section 5.5.2 and Annexure G of Appendix J (Technical working paper: Noise and vibration) of the EIS).

Noise and vibration arising from the site management works at Rozelle Rail Yards would not be expected to interact with that of the M4-M5 Link project as these would be completed before construction commences.

In situations where consecutive long term construction noise impacts occur, at-property noise mitigation may be considered where feasible and reasonable, if options for at source noise mitigation and management measures have been exhausted. The requirement for this would be evaluated in consultation with Roads and Maritime and the community during detailed design, and would be considered when preparing the site specific CNVISs. Feasible and reasonable considerations for providing at-property treatments should include:

- Time of day of the impacts and exceedance of criteria
- Time of impacts at the affected receivers
- How long the mitigation will provide benefit to the receiver during the project.

Optimal design of acoustic sheds, noise barriers/hoarding and management measures to reduce the impacts as far as practicable.

The assessment of construction noise and vibration on heritage items has been conducted in accordance with the SEARs and a range of guidelines including the CNVG and the German Standard DIN 4150. Noise impacts specifically would not be expected to have any impact upon the value of heritage items themselves. The amenity of any residents or other occupants of heritage buildings has been considered as part of the EIS (refer to section 5.3 of Appendix J (Technical working paper: Nosie and vibration) of the EIS for further information regarding potential noise impacts at Rozelle during the construction of the project.

The construction vibration assessment assessed the impact on heritage items. Anticipated vibration levels would be confirmed through location and activity specific vibration assessments. The recommended minimum working distances for vibration generating plant in relation to heritage items was referenced from DIN 4150 and are listed in Table 4-12 of Appendix J (Technical working paper: Noise and vibration) of the EIS.

The construction vibration assessment for Rozelle identified 19 heritage items (including four heritage conservation areas, some landscape items and an area of open space) within the cosmetic damage minimum working distances, noting that cosmetic damage is very minor in nature, is readily repairable and does not affect the structural integrity of the building. These heritage items are summarised in **Table C10-3**.

The construction type classifications and structural integrity of all the listed heritage items would be confirmed during detailed design by a suitably qualified structural engineer. This information would then be used to verify the applicable vibration criteria and associated impacts.

Vibration impacts upon listed heritage items would be managed through the use of building surveys, selection of appropriate construction methods and equipment and vibration monitoring during construction. The project would also use notifications and respite periods so as to manage impacts upon residents.

Table C10-3 Listed heritage items within cosmetic damage – Rozelle

NCA	Item name[1]	Address[1]	Construction type[2]
NCA16, NCA19	Brennan's Estate Heritage Conservation Area	Rozelle	n/a
NCA18	Stormwater canal	Lilyfield Road, Rozelle	Stonework, brickwork, concrete
NCA18	'Cadden Le Messurier'	84 Lilyfield Road, Rozelle	Stonework, brickwork, concrete
NCA18	Former hotel	78 Lilyfield Road, Rozelle	Stonework, brickwork, concrete
NCA18	Sandstone Cutting	Former Rozelle Rail Yard - East	Sandstone
NCA18	Sandstone Cutting	Former Rozelle Rail Yard - West	Sandstone
NCA18, NCA20, NCA21	Whites Creek Stormwater Channel No 95	Railway Parade to Parramatta Road, Annandale	Stonework/concrete
NCA21	Annandale (Railway Parade) Railway Bridge	Railway Parade, Annandale	Steel structure
NCA21	Annandale Heritage Conservation Area	Annandale	n/a
NCA21	Avenue of *Phoenix canariensis*	Railway Parade, Annandale	n/a
NCA21	Street trees – row of palms	Railway Parade, Annandale	n/a
NCA21	Iron/sandstone palisade fence	Bayview Crescent, Annandale	Iron/sandstone
NCA21	Street trees – row of brush box	Bayview Crescent, Annandale	n/a
NCA23	Annandale (Johnston Street) Underbridge	Johnston Street, Annandale	Steel structure
NCA24	Easton Park	Denison Street, Rozelle	n/a
NCA24	Easton Park Heritage Conservation Area	Rozelle	n/a

NCA	Item name[1]	Address[1]	Construction type[2]
NCA24	Sewage Pumping Station No 6 (SP0006)	Lilyfield Road, Rozelle	Brickwork
NCA25	Hornsey Street Heritage Conservation Area	Rozelle	n/a
NCA26	White Bay Power Station	Victoria Road, Rozelle	Brickwork, steelwork, concrete

Notes:
1 List of heritage items extracted from Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS.
2 Estimated from photographic information and should be confirmed onsite.

C10.2.3 Noise and vibration assessment of tunnel construction

Submitters raised concerns that the noise assessment associated with the construction of tunnels was inadequate. Specific concerns include:

- The EIS has not confirmed the location of tunnel cross-passages in the vicinity of the Camperdown area. As a result of this, noise and vibration impacts are indicative only
- Rockbreakers and blasting may be used for tunnel construction, but the modelling of the noise impacts from these construction methods was not provided in the EIS – these would be modelled after approval of the M4-M5 Link project
- Modelling for ground-borne construction noise was based on a worst-case scenario of tunnelling occurring immediately beneath a sensitive receiver but the EIS does not appear to show any modelling for portal construction noise
- The assessment of cumulative noise impacts from multiple tunnels being constructed (M4-M5 Link and future Western Harbour Tunnel) simultaneously has not been adequate
- The EIS does not adequately address the impacts of vibration on homes as a result of tunnelling
- Soil and subsurface conditions were not adequately considered in the assessment and have a strong influence on ground-borne vibration with vibration propagation being more efficient in stiff clay soils and that shallow rock concentrates vibration energy close to the surface and can result in vibration problems large distances away from the source. Layering of soil can also have significant effects.

Response

Cross passages within the tunnels for the project are described in section 5.3.3 and section 6.4.2 of the EIS. It is understood that blasting and/or rock-breaking is proposed to excavate benches, cross passages and other voids within the tunnel sections of the project. There is potential for ground-borne noise and vibration impacts from these activities where receivers are situated above the tunnel. While it is noted that the predicted ground-borne noise from a rockbreaker is notably higher than a roadheader at an equivalent distance, there is generally more scope to schedule rock-breaking during less sensitive time periods.

The Camperdown area is located around one kilometre from the mainline tunnel alignment and would therefore be highly unlikely to be affected by the construction of emergency cross passages.

The methodology of the assessment of ground-borne noise impacts is described in section 4.4 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Figure 4-2 of Appendix J (Technical working paper: Noise and vibration) of the EIS identifies the indicative ground-borne noise levels from roadheaders as measures on other Sydney tunnelling projects within Hawkesbury sandstone which are generally representative of the ground conditions that apply across the majority of the M4-M5 Link project footprint.

The assessment of ground-borne noise considers ground-borne noise from roadheader tunnelling works. The use of rockbreakers and blasting as part of the construction of the mainline tunnels is discussed in section 10.3.7 and Chapter 6 (Construction work) of the EIS and the impact of blasting is considered in Chapter 10 (Noise and vibration) of the EIS.

Blasting has the potential to significantly reduce the noise and vibration impacts if managed appropriately by the design and construction contractor(s). Blasting is proposed as an excavation technique because the vibration impacts from blasting are of a much shorter duration for nearby sensitive receivers compared to the vibration impacts associated with mechanical excavation methods such as roadheaders and rockbreakers.

If blasting is proposed by the design and construction contractor(s), vibration impact predictions for blasting operations should be undertaken in the detailed design phase when more information is available on the blasting scope and methods. Blasting specific noise and vibration mitigation methods should be incorporated into the CNVMP.

Blasting should be restricted to standard daytime hours only (except where approved by the relevant authority). Site investigations should be conducted prior to production blasting to define suitable blast sizes and site laws to comply with project blasting noise and vibration criteria. Dilapidation studies of nearby receiver buildings may be required where potential for exceedances of the blasting criteria are identified.

For each site where surface access to the tunnels is to be constructed an assessment of noise has been undertaken for all relevant elements of the work. The surface element of these access tunnels has been assessed as part of the 'tunnelling and support works' scenario. The assessment of tunnelling noise associated with access tunnels is included for all locations.

Cumulative noise impacts have been assessed at a variety of scales for each location within the study area. This includes the consideration of multiple M4-M5 Link construction scenarios occurring at the same time, as well as consideration of the project alongside other foreseeable future projects. At Rozelle the construction noise associated with the use of the surface construction facility for the proposed future Western Harbour Tunnel has been included as part of the ROZ-15 construction scenario. This scenario has been assessed alongside six other M4-M5 Link scenarios as part of the site's cumulative assessment scenario (refer to section 5.3.1 of Appendix J (Technical working paper: Noise and vibration) of the EIS). The construction traffic noise arising from the proposed future Western Harbour Tunnel site alongside that of the M4-M5 Link site has also been assessed (section 5.3.3 of Appendix J (Technical working paper: Noise and vibration) of the EIS).

The assessment has not considered the potential ground-borne noise arising from the tunnelling of the proposed future Western Harbour Tunnel alongside tunnelling for the M4-M5 Link project on the basis that it is unlikely that the tunnelling for both projects would be undertaken at the same time in the event that they occur in an overlapping area. Adequate vertical and/or horizontal separated would be maintained between the tunnels of the respective projects.

As part of this the construction noise associated with construction traffic movements from the proposed future Western Harbour Tunnel has been considered. The civil construction of entry and exit ramps, tunnel portals, tunnels and civil infrastructure for connecting to the proposed future Western Harbour Tunnel and Beaches Link (extending generally to the Balmain suburb boundary) is included as part of the M4-M5 Link project and therefore considered in the project noise and vibration assessment. The cumulative impact of the operation of roadheaders during tunnelling for the remaining sections of the proposed future Western Harbour tunnel project has not been quantitatively considered due to the fact the Western Harbour Tunnel project has not yet been submitted or assessed for planning.

The potential impacts to residential properties associated with vibration arising from tunnelling activities has been assessed within the EIS. For each construction site the potential for activities to exceed vibration thresholds for cosmetic damage and human response, with the number of potentially affected residential and light commercial properties specifically outlined.

The effects of layered soils are negligible in the near field (ie close to the source) where the vibration levels are greatest. In the nearfield vibration attenuation is determined by geometric attenuation which has been accounted for in the modelling. The effects of reflections and/or absorption due to layered soils or other unknown subsurface conditions may be observable at great distances from the source where the vibration levels are small and not likely to result in vibration impacts.

C10.3 Airborne noise during construction

1,590 submitters raised concerns about the airborne noise during construction. Refer to section 10.3 of the EIS and Chapter 5 of Appendix J (Technical working paper: Noise and vibration) of the EIS for details of potential noise and vibration impacts during construction.

C10.3.1 General airborne noise impact concerns during construction

Submitters have raised concerns regarding noise impacts during the construction of the project. In summary, issues included:

- Construction noise impacts on local dwellings, schools, child care centres, medical facilities, shops, services and communities in Balmain and Annandale
- General construction noise concerns, including that the noise will be constant and for extended periods
- Increase of airborne noise at St Peters occurring 24 hours a day
- Many homes around and businesses the Haberfield, Iron Cove Link, Rozelle Rail Yards and The Crescent civil site will be affected by airborne noise including those that overlook the Rozelle Rail Yards, causing disruption and inconvenience to residents and local businesses
- The scale of the construction work between Victoria Road and Callan Park Hospital will result in significant increases in noise
- Concern about increased noise at Terry Street and Byrnes Street from works on Victoria Road including the construction of the Iron Cove Link ventilation facility
- Concern over the impacts of construction noise based on experience from other construction of preceding WestConnex projects
- Concern about construction airborne noise impacts from demolition, pavement and infrastructure works
- The removal of buildings at Rozelle will increase the strength of winds which blow across Easton Park into properties facing the park on Denison Street and this will result in more noise during construction
- Concerned about long-term impacts on the residents of Rozelle and Lilyfield from long-term noise.

Response

The assessment of construction noise has considered impacts to all receiver types as identified in the ICNG including residences, schools, commercial properties and areas of public open space. For each construction location the number and location of sensitive receivers has been mapped and included in the noise model of the proposed works on the basis of discrete noise catchments. This process allows detailed predictions of noise impacts with respect to groups of receivers and the proposed construction methodology and duration. The airborne noise impact of the proposed construction upon 'other sensitive receivers', including educational facilities, hospitals and childcare centres has been predicted for each construction location. The number of other sensitive receivers that would experience exceedances of NMLs, and the degree of this exceedance, is also outlined. It should be noted that NMLs represent the level at which consideration of feasible and reasonable noise mitigation is required. This approach has been applied to the project and receivers predicted to experience construction noise above NMLs (see below) have been subject to mitigation consideration.

Throughout the project only two 'other sensitive receivers' would be subject to construction noise exceedances of greater than 20 dBA – one childcare centre (Rosebud Cottage Childcare Centre) near the Rozelle civil and tunnel site (C5) and one school (Bridge Road School) near the Pyrmont Bridge Road tunnel site (C9). It should be noted that Bridge Road School is subject to exceedances arising from two construction scenarios, both of which are predicted to last less than two months. The vast majority of exceedances for other sensitive receivers throughout the project would be less than 10 dBA.

Impacts on specific community receivers are discussed where exceedances indicate the location would be eligible for further consideration of noise mitigation (refer to Chapter 5 of Appendix J (Technical working paper: Noise and vibration) of the EIS).

For most construction activities, it is expected that the actual construction noise level would generally be lower than the worst case prediction made at the most-exposed receiver. This is because noise level varies depending on the combination of construction plant in operation at one time and the position of the plant item or noise sensitive receiver. Actual noise levels would vary across different stages of construction and worst case predictions would not occur continuously over the full proposed duration.

Residential airborne noise impacts at St Peters are restricted to daytime exceedance for 11 sensitive receivers (up to 6 dBA), 14 evening exceedances (up to 4 dBA) and 32 night-time exceedances (31 up to 3 dBA and one up to 9 dBA, the majority of which are due to cumulative impacts). No sensitive receivers were deemed to be highly noise affected (ie noise levels greater than 75 dBA).

It is recognised that residents and businesses around construction ancillary facilities would be subject to increased airborne noise impacts, including those at Haberfield, around the Iron Cove Link and Victoria Road, The Crescent and the Rozelle Rail Yards. These impacts would relate to a broad range of project scenarios and activities, including demolition and pavement and infrastructure works. These scenarios and their likely noise impact are outlined for each construction location in Appendix J (Technical working paper: Noise and Vibration) of the EIS. Given the urban context and large scale of the project it is unavoidable that receivers in the vicinity of construction activities would experience elevated noise levels. Construction would however generally be limited to standard construction hours to minimise amenity impacts due to noise during the evening and night-time periods where reasonable and practical.

The project has sought to minimise the scale of noise impacts as far as is reasonable and feasible in the current concept design. These measures include the use of acoustic sheds, construction hoarding, and limiting spoil haulage routes to the arterial where practical and would be further developed as part of the detailed design. Further investigations at the detailed design stage would include further measures to control noise at the source, pathway or at the receiver.

In developing construction methodologies and a construction program for the project, the aim was to minimise the duration of the construction period while maintaining an acceptable and manageable amenity outcome for surrounding receivers. The need to reduce both the duration and magnitude of potential noise impacts would continue to be considered during the development of the detailed construction methodology.

Feasible and reasonable management measures would be confirmed during detailed design.

The project would require the demolition of several large buildings on the south side of Lilyfield Road in Rozelle. The construction noise impacts associated with site establishment (including demolition) and ongoing activities within the Rozelle civil and tunnel site are outlined in Appendix J (Technical working paper: Noise and vibration) of the EIS. These predictions are based upon three dimensional noise modelling which has taken into account the topographical nature of the site and the impact created by removal of buildings. Changes to local air movements (and noise) resulting from the removal of buildings are expected to be negligible in the context of the site overall. Operational infrastructure is proposed for the project at the Rozelle Rail Yards (refer to section 5.6 of the EIS) which may also influence the propagation of noise in the area.

Appendix J (Technical working paper: Noise and vibration) of the EIS assessed the magnitude and impact of noise impacts associated with construction at the Rozelle site, which is adjacent to Lilyfield Road. This assessment was undertaken for the duration of construction, which was noted to commence Q4 2018 and be completed during Q3 2023. In addition to this, the impacts associated with construction noise were further considered in Appendix K (Technical working paper: Human health risk assessment) and Appendix P (Technical working paper: Social and economic) of the EIS. Daytime noise impacts were considered in the social and economic assessment as being a minor negative overall, with night time impacts being moderate negative. Potential health impacts to residents were noted in the Human Health Risk Assessment in cases where mitigation measures are not taken up.

C10.3.2 Construction noise associated with the Darley Road civil and tunnel site (C4)

Submitters have raised concerns regarding noise impacts to nearby receivers from the Darley Road civil and tunnel site (C4). Particular concerns raised included the following:

- General concerns surrounding the unacceptable noise impacts the site will have on surrounding homes and businesses
- Severe noise impacts on hundreds of residents
- Concern over increased noise from traffic movements and heavy vehicle loading and unloading at the site
- Homes being highly noise affected for the 10 week period that the existing building would be demolished and for much of the five year construction period
- Concern over the noise impacts resulting from temporary traffic diversions along Darley Road onto local roads and streets that may be required during construction
- Concern over the construction noise resulting from the site due to the construction of the temporary access tunnel
- Increased noise impacts from workers parking in local streets and undertaking shift changeovers 24 hours a day
- Concern about night-time noise exceedances (of levels up to 39 dBA) forecast during the construction of the access ramps
- Concerned about the engine noise from increased truck movements from the site to Charles Street intersection, particularly when approaching up the grade.

Response

The existing background noise environment at Darley Road is influenced by traffic noise from City West Link to the north and Darley Road to the south, noise from the operation the light rail corridor to the north and aircraft noise given the site is located in a Sydney Airport flight path.

Tunnelling and tunnel support activities would be undertaken 24 hours a day, seven days per week at the Darley Road civil and tunnel site (C4). All spoil haulage at the Darley Road civil and tunnel site (C4) would be limited to standard construction hours.

Works outside of standard construction hours would be required for some construction activities, such as modifications to Darley Road, to impacts to the traffic network.

Work outside standard construction hours would be regulated and restricted by the NSW EPA through the Environment Protection Licence (EPL) for the project. An out-of-hours works protocol will be developed for the construction of the project (see environmental management measures NV5 in **Chapter E1** (Environmental management measures)).

During demolition of the existing buildings at the Darley Road site 127 sensitive receivers are predicted to experience daytime airborne noise exceedances up to 10 dBA. Fifteen would experience exceedances up to 20 dBA. These exceedances would occur over a period of up to four weeks and the works may require the intermittent use of concrete saws and/or rockbreakers.

Up to 99 receivers are predicted to incur high noise impacts (greater than 20 dBA above NML) at times during night-time pavement and infrastructure works. This activity requires the use of a rockbreaker, however the duration of this activity is anticipated to be relatively short at around two weeks. The rockbreaker would not be in continual operation throughout this period. Medium term duration works (up to 96 weeks) including night-time spoil handling would result in moderate (up to 20 dBA) NML exceedances for up to 23 receivers. Longer-term activities (for the duration of construction) include onsite car parking (exceedances for two receivers), and deliveries and storage (no exceedances).

The ICNG considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be Highly Noise Affected. Up to 36 receivers may be highly noise affected during the short-duration pavement and infrastructure works and up to seven receivers during demolition of existing buildings and pavement and infrastructure works.

These activities require the use of highly noise intrusive equipment such as concrete saws and road profilers and would be required outside standard daytime construction hours (pavement and infrastructure works only to avoid potential traffic impacts. These activities are expected to occur for a relatively short period of time (up to four weeks) and the use of the most noise intrusive equipment (concrete saws and road profilers) would be expected to be only occurring sporadically throughout the duration of the works. Where feasible and reasonable, highly noise intrusive equipment would be limited to works before 11:00pm or midnight in accordance with Roads and Maritime's CNVG. In certain cases noisy activities would be required to extend beyond midnight, such as for night time road works on busy roads that are required to remain open during the day. In these cases the need to reopen the road in time for the morning peak, typically before 6.00 am, would also limit the overall duration of noisy activities.

The most affected receivers are typically dwellings which surround and have direct line of sight to the various works locations (refer to Figure 5-15 of Appendix J (Technical working paper: Noise and vibration) of the EIS). Worst case noise levels, however, would only be expected to be apparent when high noise generating works are being carried out immediately adjacent to these residential receivers and these works would not be undertaken continuously throughout the duration of the works.

For most construction activities, it is expected that the actual construction noise level would generally be lower than the worst case prediction made at the most-exposed receiver. This is because the noise level varies depending on the combination of construction plant in operation at one time and the position of the plant item or noise sensitive receiver. Actual noise levels would vary across different stages of construction and worst case predictions would not occur continuously over the full proposed duration.

On-site truck movements have been assessed as part of the DAR-14 works scenario. As per DAR-12, these works would be restricted to standard daytime hours only. There are no exceedances identified for this scenario during the daytime. As identified in section 5.2.3 of Appendix J (Technical working paper: Noise and vibration) of the EIS, construction traffic noise is unlikely to result in a noticeable increase in L_{Aeq} noise levels at receivers along the proposed routes. All spoil haulage at the Darley Road civil and tunnel site (C4) would be limited to standard construction hours.

With regard to increased traffic noise, construction traffic at Darley Road would enter and exit the site from the direction of City West Link. This would not require the permanent closure of the road, though temporary and/or partial closures may be required when pavement works are undertaken. Based on the nature of this road such roadworks are likely to be undertaken at night-time (10pm to 7am). While such diversions have the potential to increase local traffic noise on these roads such events would be rare and would typically only occur at times when overall traffic levels are low, reducing the severity of the potential impact. Onsite car parking and workshop activities, deliveries, maintenance and storage were assessed as part of the construction noise impact assessment. The assessment indicated that these activities would incur an exceedance at one noise catchment area, NCA13, of 5 dBA in the evening and 12 dBA at night. These noise exceedances would be further investigated during detailed design, including further management as part of the Construction Traffic and Access Management Plan (CTAMP) and CNVMP.

The construction of the temporary access tunnel at the Darley Road site would occur early in the overall construction program. This construction would incur both airborne and ground borne noise impacts. The airborne noise element (outside of the acoustic shed) of this construction would occur between Q4 2018 and Q1 2019 lasting approximately 36 weeks. Two noise catchment areas, NCA09 and NCA13, would be subject to daytime exceedances of 5 dBA and 13 dBA respectively. There would be no night time exceedances. Ground-borne noise would also be incurred during this construction activity. There would be exceedances for up to 10 receivers in NCA13. These exceedances would be up to 4 dBA and impact the most affected receivers for up to 14 days. It should be noted that these exceedances (airborne and ground borne) would not be constant during construction and would only occur when the noisiest equipment is operating in the vicinity of the nearest sensitive receivers. Further to this, these exceedances would be further investigated during detailed design with view to implementation mitigation and management measures to reduce the number and magnitude of the exceedances.

As outlined above night time noise exceedances of up to 10 dBA may occur during construction of the access ramps at Darley Road. There would not be any exceedances up to 39 dBA.

The Charles Street intersection is located to the west of the construction site along Darley Road. Construction traffic for the site would generally only approach the site from City West Link and would therefore approach on a downwards gradient to Charles Street. This traffic has been assessed as part of noise and vibration modelling undertaken for the EIS. This modelling indicated that traffic noise would generally contribute increases less than 0.5 dBA in the daytime and 0.6 dBA at night. These increases would generally not be perceptible above the existing background traffic noise levels.

Management measures to manage noise impacts during construction are discussed below and summarised in **Chapter E1** (Environmental management measures).

Management of construction impacts

Mitigation measures would be considered to further reduce the potential impacts on the highly noise affected receivers described above and other sensitive receivers in the vicinity of the Darley Road civil and tunnel site.

The assessment of construction impacts identified the following in-situ mitigation measures that should be considered for inclusion at the Darley Road civil and tunnel site (C4):

- Increased site hoarding to a height of four metres around the construction ancillary facility
- Upgrading the acoustic shed performance
- Limiting the total internal sound power level to 110 dBA within the acoustic shed or designing and constructing the acoustic shed to ensure that night-time noise management levels are not exceeded.

Works outside standard construction hours will be regulated by the NSW EPA through a project EPL to minimise the potential for amenity impacts. The NSW EPA typically restricts the number of nights per weeks on which works that are likely to generate noise levels above noise management levels can be undertaken. An out-of-hours works protocol will be developed for the construction of the project (see environmental management measures NV5 in **Chapter E1** (Environmental management measures)).

In addition to this a CTAMP would be prepared for the project and would include a construction worker parking strategy. This strategy would aim to manage parking to reduce amenity impacts parking on local streets including during shift changeovers. Additional parking is proposed at the White Bay civil site (C11) (see **Chapter D2** (White Bay civil site (C11))) which would reduce the requirement for parking of local streets around Darley Road. The White Bay Civil site (C11) would accommodate around 50 additional construction workforce parking spaces, as well as provide a truck marshalling area for around 40 heavy vehicles. See **section B11.8.6** for further information regarding construction workforce parking.

Based on the predicted level of construction noise impacts the use of noise barriers along the south of Darley Road is not considered to be reasonable or feasible, and would potentially create issues for connectivity, visual impact and overshadowing. The likely noise impacts would however be further assessed once a detailed design has been prepared. The preferred noise control strategy would be confirmed at this point. See **Chapter E1** (Environmental management measures) for further detail on the construction noise management measures.

C10.3.3 Airborne noise impacts on key receivers from construction

Submitters were concerned that construction noise would impact on key receivers including children who attend Rozelle Public School and other educational facilities, due to the location of these facilities near proposed construction and demolition activities. Specific concerns include:

- Noise impacts from the construction of the ventilation facility next to Rozelle Public School which may be 24 hours a day, seven days a week.
- Concern over the impact of construction noise from the proposed Parramatta Road West civil and tunnel site on nearby Haberfield Public School and the Yasmar Juvenile Justice facility
- Impacts from the Pyrmont Bridge Road tunnel site on nearby Forest Lodge Public School.
- Concern regarding noise impacts from construction activities (vehicle movements, rockbreaking, generators, chainsaws, excavation etc) on the Malt Shovel Brewery from the adjacent Pyrmont Bridge Road tunnel site as it is unclear whether all these activities will take place within the proposed acoustic shed

- Excessive noise impacts on a number of childcare centres around the Rozelle, Lilyfield and Annandale areas including:
  - Childcare Explore and Develop
  - Billy Kids Learning
  - Rosebud Cottage Child Care Centre
  - The Crescent Early Learning Centre
  - St Thomas Child Care Centre.

Response

Rozelle Public School

Rozelle Public School is located within NCA31. The background noise environment at this location is influenced by traffic noise from Victoria Road and Darling Street as well as aircraft noise given the school is located within in a flight path for Sydney Airport. The construction footprint associated with the Iron Cove Link civil site (C8) is located approximately 140 metres from the nearest boundary of Rozelle Public School. The Iron Cove Link civil site (C8) is located at a lower elevation than Rozelle Public School.

During higher noise generating activities, such as during roadworks and concrete works, it is predicted that the school would potential experience a worst case noise level of up to 75 dBA in noise levels, resulting in exceedances of the NML by up to 20 dBA. Generally the NML exceedances arising in this noise catchment area would be temporary and attributable to the intermittent use of noisy plant items such as concrete saws and rockbreakers. These items would not operate continuously through the construction period, with most operation being early in the program when the removal of existing concrete or excavation is required. Noisy items of plant would also move around the work site and as such the worst case predicted impacts would only occur when the plant items are in close proximity to the school. During the construction of the ventilation facility noise impacts are not predicted to exceed the NML for education facilities, or any of the 'other sensitive receiver' categories. This includes the nearby Rozelle Public School.

The vast majority of construction traffic from the Iron Cove Link civil site (C8) would enter and exit the site along Victoria Road. Construction traffic is unlikely to use local roads in and around the site, apart from Victoria Road. The indicative site layout plan shows that the civil site is principally located along the south side of Victoria Road, the opposite side of the road to Rozelle Public School.

There is the potential for works, such as roadworks and utility works, at the Iron Cove Link civil site (C8) in the vicinity of Rozelle Public School to occur outside standard construction hours, however these works would not coincide with the school's core operating hours.

Haberfield Public School

Haberfield Public School is located within NCA07. The existing background noise environment around Haberfield Public School is dominated by noise from traffic on Parramatta Road. The construction footprint associated with the Parramatta Road East civil site (C3b) is located approximately 75 metres from the nearest boundary of Haberfield Public School.

During high noise generating activities it is predicted that the school would be subject to noise levels of up to 60 dBA, resulting in an exceedance of the NML by up to 5 dBA. As identified in Table 5-29 of Appendix J (Technical working paper: Noise and vibration) of the EIS, the key high noise generating activities would generally occur as part of site establishment, utility works, pavement/infrastructure works and the establishment of construction activities which are generally of a relatively short duration. Exceedances would only partially affect two buildings in the west of the school site for a period of up to four weeks. These exceedances would be attributable to the intermittent use of noisy plant items such as concrete saws and rockbreakers. These items would not operate continuously through the construction period, with most operation being early in the program when the removal of existing concrete or excavation is required. Noisy items of plant would also move around the work site and as such the worst case predicted impacts would only occur when the plant items are in close proximity to the school. There would be no exceedances of daytime NMLs for tunnelling and supporting works, construction of ventilation facility or, site rehabilitation.

Construction traffic would typically enter and exit the Parramatta Road East civil site via Parramatta Road. Construction traffic is unlikely to use local roads in and around the site, including Bland Street (on which Haberfield Public School is located).

There is the potential for works, such as utility works, in the vicinity of Haberfield Public School to occur outside standard construction hours, however these works would not coincide with the school's main operating hours.

Yasmar Juvenile Justice Facility

This facility would be subject to exceedances of up to 20 dBA while noisy plant is operating as part of demolition activities which are scheduled to last up to four weeks. The facility would be subject to exceedances of up to 10 dBA during other work scenarios (such as utility works) scheduled to last up to four weeks, when noisy plant is operating.

Standard mitigation at the source and path would be implemented across the site to address exceedances of the NML. For exceedances of less than 10 dBA the closure of external windows while noisy plant is operating is likely to mitigate noise to a level that meets the internal NML.

Forest Lodge Public School

Forest Lodge Public School is located around 550 metres northeast of the Pyrmont Bridge Road tunnel site. During construction this school would not be subject to any direct construction noise impact due to this separation distance. Further to this, construction traffic from the Pyrmont Bridge Road site would travel to and from the site along Parramatta Road and a small section of Pyrmont Bridge Road adjacent to Parramatta Road and as such would not affect the school.

Malt Shovel Brewery

Detail on the specific noise impacts associated with the Pyrmont Bridge Road tunnel site are outlined in section 5.5 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Further detail is provided in the Annexure G of Appendix J (Technical working paper: Noise and vibration) of the EIS including predicted construction noise contours for this site. These contours indicate that receivers in close proximity to the site (including the Malt Shovel Brewery which is located about 40 metres from the Pyrmont Bridge Road tunnel site in NCA 41) would be subject to noise impacts exceeding 75 dBA during the daytime while site establishment works are undertaken (up to eight weeks duration). This would reduce in later stages of the project, with tunnelling and supporting works predicted to typically be less than 55 dBA during the daytime. It should be noted that similar evening and night time noise levels would also be expected for these sites during the various stages. These noise impacts would occur in the context of a noise environment dominated by high levels of existing traffic along the nearby Parramatta Road. Various mitigation measures would be further considered for this site during detailed design including scheduling of activities and the use of non-tonal reversing beepers. These would be further outlined in the CTAMP and CNVMP.

Noise impacts at the Pyrmont Bridge Road site are expected to be higher during the early stages of construction while existing buildings are demolished and site elements are established. These works are expected to last around eight weeks. None of these works would be carried out within an acoustic shed as the shed would only be constructed once the site is cleared, which may not occur until several months into the construction program.

Childcare centres in the vicinity of the project

Section 5.2.1 of Appendix P (Technical working paper: Social and economic) of the EIS identified the following childcare centres within close proximity of the construction ancillary facilities in the Rozelle, Lilyfield and Annandale areas:

- Explore and Develop
- Emmerick Street Community Preschool
- Billy Kids Lilyfield Early Learning Centre
- Zero Up Childcare
- OAC Leichhardt
- My Stepping Stone
- St Columba's North Leichhardt OSHC

- Rosebud Cottage Childcare Centre
- Lilyfield Early Learning Centre
- Hilda Booler Kindergarten
- Balmain Cove Early Learning Centre
- Rozelle Out of School Hours Care
- St Thomas' Child Care Centre
- Balmain Cove Early Learning Centre
- Rozelle Child Care Centre.

While not identified in the EIS as being within close proximity of a construction ancillary facility, The Crescent Early Learning Centre is located around 250 metres south of The Crescent Civil Site (C6).

As part of the noise and vibration assessment childcare centres were specifically considered (refer to Chapter 5 of Appendix J (Technical working paper; Nosie and vibration) of the EIS). While the ICNG and AS2107 do not provide specific guideline noise levels for childcare centres, these facilities are known to have internal play areas and sleeping areas. For internal play areas an internal NML of 55 dBA $L_{Aeq(15minute)}$ was considered appropriate, with an internal NML of 40 dBA $L_{Aeq(15minute)}$ (when in use) for sleeping areas. The external façade NML for these areas was 65 dBA and 50 dBA respectively on the assumption that the building fabric attenuates approximately 10 dBA with windows open. On the basis that internal layouts of these centres is not known the more conservative 50 dBA NML was adopted for all centres.

The noise and vibration assessment indicated the following exceedances for childcare centres the above areas:

- Haberfield (Option A) – exceedances at four childcare centres, all below 10 dBA
- Haberfield (Option B) – exceedances at three childcare centres with most exceedances being less than 10 dBA. One centre would be subject to exceedances of up to 20 dBA
- Darley Road civil and tunnel site – exceedances of up to 20 dBA for two childcare centres, being Explore and Develop and Billy Kids Learning
- Iron Cove Link civil site – exceedances at five childcare centres of up to 10 dBA
- Rozelle – exceedances at two childcare centres of up to 10 dBA during the majority of construction activities. One of these centres, Rosebud Cottage Child Care Centre, would be subject to exceedances greater than 20 dBA
- Pyrmont Bridge Road – exceedances at three childcare centres, all below 10 dBA
- St Peters – no exceedances at any child care centres.

The exceedances are based on a worst case scenario and would not be for the full duration of the proposed construction activities. Actual noise levels would vary depending on the type of equipment in operation and the location of noise generating equipment and activities in relation to the receiver. Refer to Chapter 5 of Appendix J (Technical working paper: Noise and vibration) of the EIS for further detail.

Standard mitigation would be applied with respect to all childcare centres with the potential to exceed NMLs. For the majority of the identified exceedances (ie those less than 10 dBA) the closure of external windows while noisy plant is operating is likely to mitigate noise to a level that meets the internal NML. For those centres that are predicted to experience greater noise exceedances additional mitigation measures, as outlined in section 4.6.2 of Appendix J (Technical working paper: Noise and vibration) of the EIS may be applied. In addition, as discussed in section 6.2.2 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Rosebud Cottage Child Care Centre in Rozelle (within NCA25) is also likely to qualify for consideration of additional operational noise mitigation (such as architectural treatments). Should this be confirmed during detailed design it is proposed that these measures be considered for installation early in the construction program to provide a degree of mitigation from both construction and operational noise impacts.

As indicated in Appendix G (Draft Community Consultation Framework) of the EIS, meetings would be held with stakeholders near construction ancillary facilities and work sites, especially residents, schools, childcare centres and other businesses, to understand their needs and manage these in a reasonable manner.

C10.3.4 Noise from vehicles and equipment at the construction ancillary facilities

Submitters were concerned that the use of a large number of on-site diesel generators for which there is no Australian Standard for their safe operation which will subject nearby residents to ongoing noise pollution. They were also concerned about the construction noise from the temporary ventilation facilities.

Response

Consistent with most major construction projects in urban areas, noise impacts are likely to occur as a result of construction activities including the movement of vehicles and machinery and the installation of infrastructure. The potential noise impacts associated with this equipment can vary greatly depending on factors such as the relative proximity of sensitive receivers, the overall duration of the construction work, the intensity of the noise and vibration levels, the time of day at which the construction work is undertaken and the implementation of mitigation and management measures.

The typical sound power level of a diesel generator is up to 95 dBA. The sound power level of temporary ventilation equipment varies greatly depending on the scale of the equipment, which is dependent on the size of the facility to be ventilated. During construction the positioning and orientation of static plant and equipment would be done as to minimise noise impacts on surrounding sensitive receivers Should this not be possible or exceedances at neighbouring sensitive receivers are still considered likely additional mitigation such as the use of hoarding around the equipment and the selection of quieter equipment would be considered on a case by case basis. The project would aim to connect mains electricity to all construction ancillary facilities early in the program to avoid the need to use diesel generators. However this may not be possible or practical at all sites and as such diesel generators may need to be used. In these cases the project would apply noise source mitigation measures, as proposed within Appendix J (Technical working paper: Noise and vibration) of the EIS (section 5.8.1). This includes the careful siting of plant, use of mobile acoustic enclosures or the use of localised hoarding around noise generating plant items as appropriate. The need for such items would be confirmed at the detailed design stage and would be subject to advice from the project's Independent Acoustics Advisor.

Detailed noise assessments would be carried out for all ancillary facilities required for construction of the project. The assessment would consider the proposed site layouts and noise generating activities that would occur at the facilities and assess predicted noise levels against the relevant noise management levels determined in accordance with the requirements of the ICNG. The assessments would be used to determine the appropriate heights and configurations of noise barriers, and other appropriate noise management measures, consistent with the requirements of the ICNG and the CNVG. Noise barriers, as confirmed through the noise assessments, would be installed as early as possible during site establishment and as a minimum prior to the commencement of excavation associated with tunnel access.

An EPL would be obtained from the NSW EPA for the purposes of managing and regulating noise levels across the site. The EPL will apply the noise management levels from the ICNG, with provisions for restricted works above noise management levels outside standard construction hours in certain circumstances. Measures will have to be implemented to ensure general noise from ancillary facility operation complies with noise management levels outside standard construction hours (including plant such as diesel generators).

Monitoring will be carried out at the commencement of activities for which a location and activity specific noise and vibration impact assessment has been prepared to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the management measures that have been implemented are appropriate (see environmental management measure NV6 in **Chapter E1** (Environmental management measures)).

The requirement for consideration of additional feasible and reasonable mitigation on the basis of long term impacts will be evaluated in consultation with Roads and Maritime and the community during detailed design and considered when preparing the site specific Construction Noise and Vibration Impact Statements.

C10.3.5 Noise from construction ancillary facilities

Submitters have raised concerns regarding noise impacts to nearby receivers from construction ancillary facilities located at Haberfield, Ashfield, Rozelle, Iron Cove, Camperdown and at The Crescent and Pyrmont Bridge Road. Specific concerns included:

- The impact of noise from excavation, stockpiling and haulage, the use of rockbreakers and concrete saws originating from the facilities on nearby residents and businesses, some of which have been built as early as 1890
- The impact of noise above acceptable levels, above 75dB, for some nearby residences for periods of construction which may last for years
- The number of properties that would be affected by noise impacts and the expected duration of the impacts which may result in little respite for residents
- Concern for residents adjacent to proposed sites will be subjected to noise impacts particularly residents on Alt, Bland and Ilford Streets, Ashfield.

Response

The assessment of construction noise has considered impacts to all receiver types as identified in the ICNG including residences, businesses, schools and areas of public open space. An overview of the potential noise impacts associated with construction activities at construction ancillary facilities is provided in Chapter 5 of Appendix J (Technical working paper: Noise and vibration) of the EIS and in the sections below.

Haberfield – Option A

Activities for Option A in the Haberfield area would occur within three construction ancillary facilities (Wattle Street civil and tunnel site (C1a), Haberfield civil and tunnel site (C2a) and Northcote Street civil site (C3a) on Parramatta Road, Wattle Street, and Northcote Street (consistent with the sites used during construction of the M4 East project).

In this area, up to 19 receivers are predicted to incur high noise impacts (>20 dBA above NML) during pavement and infrastructure works associated with the construction of the project. This activity requires the use of a concrete saw however the duration of this activity is anticipated to be relatively short at around two weeks. Longer-term activities (up to the duration of construction of the project) include onsite traffic movements, tunnelling support and building fitout however the predicted noise impacts from these activities are minor (less than 10 dBA above NML). While the magnitude of the predicted exceedance is relatively low, these impacts are predicted at receivers which would likely have been exposed to noise impacts from the interfacing M4 East project. These receivers are those adjoining the Northcote Street civil site (C3a) and Wattle Street that have line of sight to the Wattle Street civil and tunnel site (C1a). The requirement for consideration of additional feasible and reasonable mitigation on the basis of longer term impacts will be evaluated in consultation with Roads and Maritime and the community during detailed design and considered when preparing the site specific CNVIS for this area. Up to five receivers (mainly to the north of Wattle Street) may be highly noise affected during the short-duration pavement and infrastructure works, and establishment of the construction facilities.

Predicted noise from construction traffic on the public roads is not predicted to result in a noticeable increase in noise levels at receivers along the proposed haulage routes (Wattle Street and Parramatta Road).

Haberfield – Option B

Activities for Option B in the Haberfield area would occur within three construction ancillary facilities (Parramatta Road West civil and tunnel site (C1b), Haberfield civil site (C2b) and Parramatta Road East civil site (C3b)), which are situated on Parramatta Road and Wattle Street adjacent to the M4 East project footprint.

Up to 42 receivers are predicted to incur high noise impacts (>20 dBA above NML) during pavement and infrastructure works, which require the use of a concrete saw. However, the duration of this activity is anticipated to be relatively short at around two weeks. Longer-term activities (up to the duration of construction of the project) include onsite car parking, deliveries and storage, tunnelling activities and spoil handling. The predicted noise impacts from these activities are typically less than 10 dBA above NML however up to three receivers are predicted with high (>20 dBA above NML) exceedances during night-time tunnelling activities. This could be reduced to two receivers by using an upgraded acoustic shed and could be limited to less than 20 dBA by limiting the total sound power level of equipment operating within the shed to 110 dBA. Up to 13 receivers may be highly noise affected during the short-duration demolition works.

Cumulative tunnelling works are predicted to result in five receivers potentially experiencing a high (>20 dBA above NML) exceedance which could be reduced to one receiver by using an upgraded acoustic shed.

Impacts are predicted at receivers which would likely have been exposed to noise impacts from the interfacing M4 East project. These receivers adjoin the Parramatta Road West civil and tunnel cite (C1b), Parramatta Road East civil site (C3b) and Haberfield civil site (C2b), between Walker Avenue and Chandos Street. The requirement for consideration of additional feasible and reasonable mitigation on the basis of long term impacts will be evaluated in consultation with Roads and Maritime and the community during detailed design and considered when preparing the site specific CNVIS for this area. Predicted noise from construction traffic on the public roads is not predicted to result in a noticeable increase in noise levels at receivers along the proposed haulage routes (Parramatta Road) due to the existing high volumes of traffic on Parramatta Road.

Darley Road

Activities in the Darley Road civil and tunnel site (C4) would be located on land adjacent to the Leichhardt North light rail stop, between City West Link and Darley Road.

Up to 99 receivers are predicted to incur high noise impacts (>20 dBA above NML) during out-of-hours pavement and infrastructure works, which require the use of a rockbreaker, however the duration of this activity is anticipated to be relatively short at around two weeks. Longer-term activities (up to the duration of the project) include onsite car parking, deliveries and storage, tunnelling activities and spoil handling. The predicted noise impacts from these activities are typically minor (less than 10 dBA above NML) however up to 26 are predicted with moderate (up to 20 dBA) NML exceedances during night-time tunnelling activities. Up to 22 receivers (surrounding the site) may be highly noise affected during the short-duration line marking works and road adjustments.

Cumulative tunnelling works, which represents a number of construction activities which have the potential to operate concurrently, are not predicted to result in any highly noise affected receivers. 26 receivers are predicted to have moderate NML exceedances which could be reduced to four receivers by using an upgraded acoustic shed. A similar scale of improvement is predicted for the minor (less than 10 dBA) impacted receivers.

Predicted noise from construction traffic on the public roads is not predicted to result in a noticeable increase in noise levels at receivers along the proposed haulage routes (Darley Road) due to the existing traffic volumes on Darley Road and City West Link.

Rozelle

Activities within the Rozelle study area would occur within three construction ancillary facilities (Rozelle civil and tunnel site (C5), The Crescent civil site (C6) and Victoria Road civil site (C7), bounded by Anzac Bridge (east) to Catherine Street (west) including the Rozelle Rail Yards.

Up to 61 receivers are predicted with high noise impacts (>20 dBA above NML) during out-of-hours roadworks, which require the use of multiple road work equipment concurrently. This activity would be carried out at different locations over the course of 3.5 years and as such would not impact the same receiver for the total duration of the works.

Up to 29 receivers (predominantly towards the east of the site) may be highly noise affected during the utility adjustment works at some point within the anticipated 64-week activity schedule when works are located immediately adjacent to the receiver. Cumulative longer-term site works, represented by a number of construction activities which have the potential to operate concurrently are not predicted to result in any highly noise affected receivers. Impacts are predicted at receivers that would likely have been exposed to noise impacts from the interfacing CBD and South East Light Rail Rozelle maintenance depot. These receivers are those adjoining Lilyfield Road between Justin Street and Ryan Street and those adjoining Brenan Street between Starling Street and White Street. The requirement for consideration of additional feasible and reasonable mitigation on the basis of long term impacts will be evaluated in consultation with Roads and Maritime and the community during detailed design and considered when preparing the site specific CNVIS for this area.

Predicted noise from construction traffic on the public roads is not predicted to result in a noticeable increase in noise levels at receivers along the proposed haulage routes (City West Link, The Crescent and Victoria Road).

Iron Cove

Activities within the Iron Cove study area would occur within the Iron Cove Link civil site (C8) located on Victoria Road, east of Iron Cove Bridge, between Byrnes Street and Springside Street, as well construction of the Iron Cove tunnel portals and ramps east of Iron Cove Bridge.

Up to 146 receivers are predicted with high noise impacts (>20 dBA above NML) during night-time utility adjustment works, which would require the use of a concrete saw. While this activity may last for around 104 weeks overall, the duration at any one receiver would be substantially less as works move around the site.

Longer-term activities (up to the duration of the project) include onsite car parking, deliveries and storage and supporting infrastructure however the predicted noise impacts from these activities are typically minor (less than 10 dBA above NML).

Up to 53 receivers (surrounding the site) may be highly noise affected during the daytime demolition works at some point within the anticipated 24-week activity schedule when works are located immediately adjacent to the receiver.

Cumulative impacts, which represents a number of construction activities which have the potential to operate concurrently are not predicted to result in any highly noise affected receivers.

Predicted noise from construction traffic on the public roads is not predicted to result in a noticeable increase in noise levels at receivers along the proposed haulage routes (Victoria Road).

Pyrmont Bridge Road

Activities within the Pyrmont Bridge Road study area would occur within the Pyrmont Bridge Road tunnel site (C9) located near the intersection of Pyrmont Bridge Road and Parramatta Road, generally in the area between Gordon Street and Mallet Street.

Up to 14 receivers are predicted with high noise impacts (>20 dBA above NML) during out-of-hours pavement and infrastructure works, which require the use of a rockbreaker however the duration of this activity is anticipated to be relatively short at around two weeks. Longer-term activities (up to the duration of construction of the project) include onsite car parking and deliveries and storage. The predicted noise impacts from these activities are typically minor (less than 10 dBA above NML) however up to four receivers are predicted with moderate (up to 20 dBA) NML exceedances during night-time spoil handling activities. This could be reduced to one receiver by using an upgraded acoustic shed. A similar scale of improvement is predicted for the minor (less than 10 dBA) impacted receivers.

Up to four receivers (mainly to the north of the site) may be highly noise affected during the pavement and infrastructure works at some point within the anticipated two-week activity schedule when works are located immediately adjacent to the receiver. Cumulative impacts, which represents a number of construction activities which have the potential to operate concurrently, are not predicted to result in any highly noise affected receivers.

Predicted noise from construction traffic on the public roads is not predicted to result in a noticeable increase in noise levels at receivers along the proposed haulage routes (Pyrmont Bridge Road and Parramatta Road).

Detail on the specific noise impacts associated with the Pyrmont Bridge Road tunnel site are outlined in section 5.5 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Further detail is provided in the Annexures to this working paper, including predicted construction noise contours for this site. These contours indicate that receivers in close proximity to the site would be subject to noise impacts exceeding 75 dBA during the daytime while site establishment works are undertaken (up to eight weeks duration). This would reduce in later stages of the project, with tunnelling and supporting works predicted to typically be less than 55 dBA during the daytime for nearby receivers. It should be noted that similar evening and night time noise levels would also be expected for these sites during the various stages.

St Peters

Activities within the St Peters study area would occur within the Campbell Road civil and tunnel site (C10) located on the southern side of Albert Street and Campbell Lane in St Peters. The site is currently part of the Campbell Road construction compound for the New M5 project.

No receivers are predicted with high noise impacts (>20 dBA above NML) during the proposed works at this site. Activities lasting up to 72 weeks include onsite vehicle movements, tunnelling support and ventilation building construction. The predicted noise impacts from these activities are typically minor (less than 10 dBA above NML) however one receiver is predicted with moderate (up to 20 dBA) NML exceedances during night-time cumulative activities. This could be eliminated by using an upgraded acoustic shed. No receivers are predicted to be highly noise affected during the proposed works at this site. While the magnitude of the predicted exceedance is relatively low, these impacts are predicted at receivers which would likely have been exposed to noise impacts from the interfacing New M5 project. These receivers are those which front Campbell Road. The requirement for consideration of additional feasible and reasonable mitigation on the basis of long term impacts will be evaluated in consultation with Roads and Maritime and the community during detailed design and considered when preparing the site specific CNVIS for this area.

Predicted noise from construction traffic on the public roads is not predicted to result in a noticeable increase in noise levels at receivers along the proposed haulage routes (Campbell Road and the Princes Highway).

As outlined above, the project would result in elevated noise levels around construction ancillary facilities during construction. The degree of construction noise impact would vary across the project depending on the nature of the location and the activities proposed at each site. It should be noted that the predicted noise impacts outlined above (including those for highly noise affected receivers) have been determined on a worst case basis, such as when high noise generating plant is operating in close proximity to sensitive receivers. These impacts are also calculated assuming only the inclusion of minimal mitigation such as the use of standard acoustic sheds and minimal site hoarding. In practice all works would be subject to standard mitigation measures such as consultation activities, construction scheduling, equipment selection and the use of noise shields around stationary noisy plant, among others.

Monitoring will be carried out at the commencement of activities for which a location and activity specific noise and vibration impact assessment has been prepared to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the management measures that have been implemented are appropriate (see environmental management measure NV6 in **Chapter E1** (Environmental management measures).

In certain cases, particularly where longer duration impacts are involved, additional mitigation measures would also be applied, including individual consultation, respite offers, the use of respite periods and alternative accommodation. It is expected that these measures would substantially reduce the overall impact of construction noise upon sensitive receivers throughout the study area.

The number of noise impact properties may be reduced upon preparation of the detailed design and the implementation of additional mitigation and management measures. This would include the offer of respite periods and potentially temporary alternative accommodation should impacts be deemed to be substantial.

Residents of Alt Street, Bland Streets and Ilford Avenue in Ashfield would be subject to construction noise impacts for both Haberfield Options A and B, though the impacts associated with Option B would be more substantial. Under the Option B scenario around six properties would be highly noise affected during site establishment works (daytime). This phase is predicted to last up to four weeks. Subsequent stages of construction would involve substantially lower noise impacts. The longest duration activity, tunnelling and supporting works, which is proposed to last around 168 weeks, would result in exceedance of the daytime NML for five properties on these streets.

The requirement for consideration of additional feasible and reasonable mitigation on the basis of longer term impacts would be evaluated in consultation with Roads and Maritime and the community during detailed design and considered when preparing the site specific construction noise and vibration impact statements for the various areas.

C10.3.6 Increased noise due to clearing of vegetation

Submitters raised concerns over the loss and clearing of mature trees and vegetation at the Darley Road civil and tunnel site, Buruwan Park and within the Rozelle Railway Yards as it is considered that they act as a barrier to noise.

Response

The removal of vegetation within this area is not expected to change the existing noise levels at nearby sensitive receivers as vegetation generally does not perform well as a noise attenuator, although it is recognised that the attenuation perceived to be provided is important at many locations. Revegetation and planting, including tree planting, would be undertaken at key locations and would be included in the Urban Design and Landscape Plans that would be developed for the project.

C10.4 Construction traffic noise

984 submitters raised concerns about construction traffic noise. Refer to section 10.3 of the EIS and Chapters 5 and 6 of Appendix J (Technical working paper: Noise and vibration) of the EIS for details of potential noise and vibration impacts during construction.

C10.4.1 Construction traffic noise concerns

Submitters raised concerns relating to noise impacts from construction vehicles including heavy vehicles, in residential streets. Specific concerns related to the following locations:

- General concern for construction traffic noise from increased heavy vehicle trips
- Concern that traffic movements resulting from the construction phase will be borne by residents in already busy areas and will affect local childcare centres and Rozelle and Haberfield Public Schools
- Concern about 24 hour construction traffic for material supply and spoil hauling from all sites (including Darley Road Site)
- Concern regarding the noise caused by heavy vehicles from the Darley Road civil and tunnel site travelling up steep hills to return to the City West Link, particularly the use of engine brakes
- Concern that the impacts of construction traffic at the Darley Road civil and tunnel site will be unacceptable for the five year construction period, with 170 heavy vehicles forecast each day with preference shown for the alternative heavy vehicle movement from City West Link
- Concern construction traffic would use local streets and cause high levels of adverse noise impacts
- The streets between Victoria Road and the former Rozelle Hospital currently have restrictions on the size of heavy vehicles allowed to access them. Concern about the increase in noise as a result of these construction vehicle movements
- Concern about traffic noise along Catherine Street at Leichhardt. The recent installation of speed bumps along this street would add additional noise of the construction heavy vehicles ‘thumping’ over the bumps
- Concern regarding the construction traffic noise from heavy vehicles entering and exiting the Pyrmont Bridge Road tunnel site.

- Further requests for details on how noise exceedances due to construction traffic would be mitigated
- Submitter is concerned by the noise of workers parking with engines idling first thing in the morning
- Concern for noise impacts in Camperdown caused by deliveries
- Concern about the noise from construction traffic by 517 trucks in Rozelle Rail Yards
- Concerned about noise from construction movements at the C5 and C6 sites and traffic around The Crescent and Johnston Street intersection
- The residents of Darley Road, Francis, Hubert and Charles Street would be affected by the noise of truck engines, exhaust and brakes.

Response

Spoil haulage routes for the project would be focused on the arterial road network and use roads such as City West Link, Parramatta Road and the Princes Highway, with the opportunity to use the M4 East and New M5 tunnels once the respective projects are operational.

The EIS notes that heavy and light construction vehicles would be required to travel along roads in the vicinity of ancillary facilities during construction. The additional noise generated by these movements was modelled and assessed with reference to the existing traffic levels on these roads. This assessment indicated that construction traffic would not result in a noticeable increase (less than 2 dBA) above the existing L_{Aeq} noise levels for any of the routes assessed.

With regard to potential night-time maximum noise events, the assessment indicated that construction traffic on the major roads was unlikely to significantly increase the number of maximum noise events due to the relatively high existing traffic volumes on these roads (refer to section 10.1.3 of the EIS for a description of maximum noise events).

During construction some use of local roads by heavy vehicles delivering materials and/or equipment may be required, however this would be minimised as far as practicable. Indicative access routes to and from construction ancillary facilities would be confirmed during detailed design and documented in the CTAMP that would be prepared for the project.

In addition, the project would aim to utilise the M4 East tunnels for spoil haulage once these are opened. This would reduce the noise impact from construction traffic on Parramatta Road and Wattle Street at Haberfield.

The noise impact of construction traffic would be further assessed upon preparation of a detailed design. Should this assessment indicate that construction road traffic noise would result in noticeable noise impacts (greater than 2 dBA above background traffic noise), further mitigation measures would be investigated.

Darley Road civil and tunnel site (C4)

Darley Road is a state road. Based on traffic counts carried out for SMC in October 2017, Darley Road carries around 16,000 average two-way vehicle movements per day. Around 10 per cent of this traffic are heavy vehicles (around 1,600 average two-way heavy vehicle movements per day). The EIS has predicted that the Darley Road civil and tunnel site (C4) would generate around seven trucks (14 movements) per hour and a total of around 100 trucks (200 movements) per day. This represents only a minimal increase in the context of existing traffic volumes on the road (around a one per cent increase in average two-way daily vehicle movements).

In recognition of the proximity of the Darley Road civil and tunnel site to an existing residential area, the EIS has proposed that spoil haulage to/from the Darley Road civil and tunnel site (C4) would be restricted to standard construction hours. Also, in response to concerns raised by submitters it is proposed to remove the proposed right turn movement from City West Link eastbound into James Street for heavy vehicles. All heavy vehicle construction traffic would now use a left turn movement from City West Link westbound into James Street. During detailed design the access arrangements to the Darley Road civil and tunnel site would be reviewed to minimise impact on existing on-street car parking and existing pedestrian access along and across Darley Road.

Heavy vehicles entering and exiting the site within the site compound are assessed under the airborne construction noise assessment in section 10.3.2 of the EIS. The highest predicted worst-case noise level is 60 $L_{Aeq(15minutes)}$, which is below the daytime noise management level of 61 dBA (noting that no out-of-hours spoil haulage would take place along Darley Road).

Pyrmont Bridge Road tunnel site (C9)

Construction road traffic at the Pyrmont Bridge Road site has been assessed in Appendix J (Technical working paper: Noise and vibration) of the EIS. This assessment indicates that the additional traffic from construction would not result in noticeable increases to local traffic noise along Pyrmont Bridge Road (less than 0.6 dBA increase).

Noise impacts at this site, including deliveries, general movements and waiting of construction vehicles would occur in the context of a noise environment dominated by high levels of existing traffic along the nearby Parramatta Road. Various mitigation measures would be further considered for this site during detailed design including scheduling of activities, specific guidance to construction workers and the use of non-tonal reversing beepers. These would be further outlined in the CTAMP and CNVMP.

Rozelle Public School

Construction road traffic noise around the Iron Cove Link civil site (C8), which is the nearest construction ancillary facility to Rozelle Public School, was assessed in the EIS (refer to section 10.3.4 of the EIS). This assessment considered the impact of additional traffic on Victoria Road arising from construction of the project.

The vast majority of construction traffic from the Iron Cove Link civil site would enter and exit the site along Victoria Road. Designated heavy vehicle routes, approved through the CTAMP, would not use local roads. The assessment indicated that the predicted increase in overall construction traffic noise levels on Victoria Road would be less than 0.5 dBA during the day, which would result in a change that would not be noticeable along the route.

During operation of the project it is predicted that Rozelle Public School would exceed cumulative noise limits. This is due to existing and future elevated road traffic noise levels which school is exposed too, As such this property would be eligible for consideration of additional mitigation measures such as architectural treatments. Should this be confirmed during detailed design it is proposed that these measures be considered for installation early in the construction program to provide a degree of mitigation from both construction and operational noise impacts.

Haberfield Public School

Construction ancillary facilities closest to Haberfield Public School include:

- Parramatta Road West civil and tunnel site (C1b)
- Haberfield civil site (C2b)
- Parramatta Road East civil site (C3b).

Construction traffic noise associated with these construction sites is assessed in section 10.3.4 of the EIS. This assessment considered the impact of additional traffic present on Parramatta Road and Wattle Street arising from construction of the project. This assessment indicated that the likely increase in overall noise levels would be less than 0.5 dBA during the day when the school would be in operation. This increase in traffic noise would result in a change that would not be noticeable along the route or at the school. It should be noted that heavy vehicle traffic associated with the project would utilise main arterial roads such as Parramatta Road and would not typically travel along Bland Street, Alt Street or Walker Avenue.

Local streets between Victoria Road and the former Rozelle Hospital

Project-related heavy vehicles are not expected to use the local streets between Victoria Road and the former Rozelle Hospital. Heavy vehicle access to the Iron Cove Link civil site (C8) would be from Victoria Road except potentially for a short period of time during the site establishment stage when some local streets may need to be used for access.

Leichhardt

Project-related heavy vehicles would not travel along Catherine Street under normal circumstances during construction. Heavy vehicles accessing the Rozelle civil and tunnel site (C5) would use City West Link, while some light vehicles may use Catherine Street.

Rozelle Rail Yards

Section 5.3.3 of Appendix J (Technical working paper: Noise and vibration) of the EIS outlines that there would be up to 517 heavy vehicle movements per day at Rozelle Rail Yards. These movements would be spread out over 24 hours. Increases in local traffic noise associated with these vehicles would be generally less than 0.5 dBA during both day and night. The proposed haulage routes for the Rozelle civil and tunnel site and The Crescent civil site (C6) would generally direct heavy vehicles onto City West Link immediately. As such noise impacts to the intersection of The Crescent and Johnston Street would be limited.

C10.5 Ground-borne noise and vibration during construction

270 submitters raised concerns about ground-borne noise and vibration impacts during construction. Refer to section 10.3 of the EIS and Chapter 5 of Appendix J (Technical working paper: Noise and vibration) of the EIS for details of potential noise and vibration impacts during construction.

C10.5.1 Noise and vibration impacts from tunnelling work (general)

Submitters have raised general concerns in relation to the impacts from ground-borne noise and vibration from tunnelling activities due to these works occurring 24 hours a day and during the night, in particular at the following locations:

- Around Darley Road civil and tunnel site and specifically James Street due to construction of the temporary access tunnel
- Rozelle, specifically Edna, Paling and Denison Streets and around the old Lilyfield quarry
- Iron Cove and Rozelle Public School
- Haberfield, particularly Haberfield Public School and Alt Street, Martin Street, Waratah Street and Dobroyd Parade.

Submitters raised the following specific concerns:

- Concern that the analysis data in Table 5-86 of the EIS is inaccurate as it does not account for vibration intensive plant during tunnelling works. This will increase ground-borne noise impacting 225 receivers near the City West Link tunnel ramp
- Noise from tunnelling activities should be imperceptible and that tunnel depths should be maximised to reduce impacts given that night-time noise management levels of 35 dBA for periods of up to 19 days
- Concern about the impacts of construction vibration and noise on the residences located at east of Gladstone Street close to the Lilyfield quarry. Submitter specifically mentions the ‘southbound north-south tunnel, centred between Starling and Gladstone Streets in Lilyfield, would be directly under the upper (western) cliff-face of the old (19th century) Lilyfield quarry and less than 30-35 metres horizontally from the much higher lower (eastern) cliff-face of this quarry, which drops vertically some two to three storeys immediately to the east of Gladstone Street and faces directly into numerous residences, subjecting them to a high likelihood of serious ground-vibration based noise’.

Response

The potential impacts from ground-borne noise from underground tunnelling work is summarised in the sections below for different locations above the alignment of project tunnels.

Ground-borne noise impacts at the various sensitive receivers above the proposed tunnelling works have been predicted using a three-dimensional model which uses elevation data for all receivers in the study area, together with the horizontal and vertical information supplied for the underground section of the road alignment. The assessment assumes a roadheader progression rate of around 20 metres per week.

Figure 4-2 of Appendix J (Technical working paper: Nosie and vibration) of the EIS identifies the indicative ground-borne noise levels from roadheaders measured other Sydney tunnelling projects within Hawkesbury sandstone which are generally representative of the ground conditions that apply across the majority of the M4-M5 Link project footprint. The ground-borne noise model calculates the three-dimensional slant distance from the tunnel crown to each sensitive receiver situated above the alignment, where tunnelling works are proposed.

At residential locations greater than a slant distance of 30 metres from the nearest tunnel (ie taking into account the tunnel depth and the horizontal offset distance), exceedances of the ground-borne NML of 35 dBA $L_{Aeq(15minute)}$ during night-time periods are unlikely. At several locations however, the tunnel depth at receivers directly above the proposed alignment is less than 30 metres.

It is understood that blasting and/or rock-breaking is proposed to excavate benches, cross passages and other voids within the tunnel sections of the project. There is potential for ground-borne noise and vibration impacts from these activities where receivers are situated above the tunnel.

Haberfield

All works with the potential to cause ground-borne noise impacts from the construction of the Wattle Street interchange are currently being undertaken as part of the M4 East project. This includes the excavation of the ventilation facility, ventilation tunnels, Wattle Street dive structures and stub tunnels, As such there would be no ground-borne noise generated by the M4-M5 Link project at this location.

In Haberfield in NCA05 (near Wattle Street, north of Martin Street), where the tunnel ramps climb to meet with the Wattle Street tunnel stubs, 46 receivers above this section are predicted to experience ground-borne noise levels above the night-time criteria. Ground-borne noise levels up to around 44 dBA $L_{Aeq(15minute)}$ are predicted when tunnelling equipment is located at the shortest distance to the receiver. Based on a progression rate of 20 metres per week, the most affected receivers are likely to experience noise levels above the night-time criterion for up to around 19 days for each roadheader (refer to section 5.7.1 of the Appendix J (Technical working paper: Noise and vibration) of the EIS).

Given the proposed depth of the tunnels, NCA06 and NC07 at Haberfield are not predicted to experience the exceedance of ground-borne noise criteria (refer to section 5.7.1 of the Appendix J (Technical working paper: Noise and vibration) of the EIS).

It should be noted that tunnelling may require several passes in order to complete, including for cross passages, stormwater/utility trenches and tunnel benches. There is however some flexibility in the timing of all non-roadheader works such that these would be scheduled for standard construction hours where reasonable and feasible.

For the excavation of the construction access tunnel at the Parramatta Road West civil and tunnel site, eight residential receivers are predicted to exceed the night-time ground-borne NML by up to 18 dBA for up to a maximum of about 20 days. While most roadheader work would be anticipated to progress at a consistent rate, there may be discrete locations which require a longer duration of tunnelling work due to site conditions.

Darley Road

Construction activities at Darley Road would be located on land adjacent to the Leichhardt North light rail stop, between City West Link and Darley Road.

Ground-borne noise from tunnelling work associated with the construction access tunnel at the Darley Road civil and tunnel site (C4) is predicted to affect 10 residential receivers through exceedance of the night-time ground-borne NML by 4 dBA for about 14 days. Although most roadheader work would be anticipated to progress at a consistent rate, there may be discrete locations which require a longer duration of tunnelling work due to site conditions (refer to section 5.2.4 of Appendix J (Technical working paper: Noise and vibration) of the EIS). Construction of the mainline tunnel in this area is not anticipated to result in exceedances of ground-borne noise criteria (refer to NCA13 in section 5.7.1 of Appendix J (Technical working paper: Noise and vibration) of the EIS).

Rozelle

Construction activities at Rozelle would occur within three construction sites (Rozelle civil and tunnel site (C5), The Crescent civil site (C6) and Victoria Road civil site (C7)) within the area bounded by Anzac Bridge (east) to Catherine Street (west), including the former Rozelle Rail Yards.

Ground-borne noise from tunnelling work associated with construction of the ventilation tunnels in the Rozelle area is predicted to affect a number of receivers in NCAs located to the north of the construction site. Based on the excavation of the ventilation tunnels, the following number of residential receivers are predicted to exceed the night-time ground-borne NML:

- 36 exceedances in NCA19 of up to 6 dBA for around 16 days
- 27 exceedances in NCA24 of up to 2 dBA for around 16 days.

While most roadheader work would be anticipated to progress at a consistent rate, there may be discrete locations which require a longer duration of tunnelling work due to site conditions.

Ground-borne noise from tunnelling work associated with construction of the access ramps in the Rozelle area is are predicted to affect a number of receivers located to the north of the construction site. Based on a progression rate of around 20 metres per week for the excavation using roadheaders, potential ground-borne noise impacts in the vicinity of the Rozelle interchange (primarily to the north of Lilyfield Road and around Catherine Street), where the tunnel ramps climb to meet City West Link, 225 receivers are predicted to experience noise levels above the ground-borne noise NML for around 19 days for each roadheader. Ground-borne noise levels of up to 45 dBA $LA_{eq(15minute)}$ are predicted when tunnelling equipment is located at the shortest distance to the receiver, though in some locations this may be as low as 36 dBA.

There are several ventilation tunnels, mainline tunnels and access ramps in this study area which may be under construction concurrently and/or consecutively. During simultaneous construction, ground-borne noise levels would be dominated by the closest roadheader to the receiver, however, where multiple roadheaders are operating at a similar distance from the receiver this may result in ground-borne noise impacts marginally higher than the predicted noise levels.

Consecutive construction with roadheaders would not increase the level of ground-borne noise but may increase the duration of impacts at any one receiver. Detailed scheduling of excavation work would be determined at the detailed design stage and would seek to minimise concurrent and consecutive construction impacts.

Tunnelling under Dennison Street at Lilyfield would occur over three events with multiple levels of the subsurface interchange proposed below this street. These would be located at depths of 10 to 30 metres, 30 to 50 metres and greater than 50 metres below ground respectively. Ground-based noise would only be apparent from the shallowest two of these events.

Iron Cove

Based on a progression rate of around 20 metres per week for the excavation using roadheaders, potential ground-borne noise impacts in the vicinity of the Iron Cove Link tunnel portals (south of Victoria Road between Toelle Street and Cambridge Street), where the tunnel ramps climb to meet Victoria Road, 29 receivers in NCA32 and NCA33 are predicted to experience noise levels above the ground-borne noise NML for about 17 days for each roadheader. Ground-borne noise levels of around 42 dBA $LA_{eq(15minute)}$ are predicted when tunnelling equipment is located at the shortest slant distance to the receiver.

During tunnelling of the mainline tunnel Rozelle Public School in NCA31 would not be affected by ground-borne noise or vibration due its distance from the alignment of the tunnel (greater than 30 metres slant distance).

Annandale

Based on a progression rate of around 20 metres per week for the excavation using roadheaders, potential ground-borne noise impacts at Annandale (between Moore Street, Catherine Street, Reserve Street and Annandale Street) where the tunnels veer north towards the Rozelle interchange, 48 receivers in NCA20 and NCA39 are predicted to experience noise levels above the ground-borne noise NML for up to 12 days for each roadheader. Ground-borne noise levels of around 37 dBA $LA_{eq(15minute)}$ are predicted when tunnelling equipment is located at the shortest slant distance to the receiver.

Tunnelling under Edna and Paling streets at Annandale (NCA21) would be greater than 50 metres below the surface. As such no ground-borne noise or vibration would be perceptible at the surface. Tunnelling under residences and the Victorian-era quarry at the northern end of Gladstone Street and Starling Street in Annandale would be about 30 metres below ground. As indicated in Figure 5-34 in Appendix J (Technical working paper: Noise and vibration) of the EIS tunnelling at this depth would not be expected to incur ground-borne noise impacts at the surface that would exceed the day or night time noise management levels.

Pyrmont Bridge Road

Construction activities in the Pyrmont Bridge Road area would result in ground-borne noise from underground tunnelling work associated with construction of the construction access tunnel. Based on the excavation of the access tunnel at this site, three residential receivers and two other sensitive receivers are predicted to exceed the night-time ground-borne noise NML for up to 16 days. While most roadheading work would be anticipated to progress at a consistent rate, there may be discrete locations which require a longer duration of tunnelling work due to site conditions.

Given the proposed depth of the mainline tunnels exceedances of ground-borne noise criteria are not anticipated in this area (refer to section 5.7.1 of the Appendix J (Technical working paper: Noise and vibration) of the EIS).

St Peters

Elements with the potential to cause ground-borne noise impacts at the St Peters study area, including excavation of the ventilation facility, ventilation tunnels, dive structures and stub tunnels, are currently being constructed as part of the New M5 project. No ground-borne noise impacts for these elements would be generated by the M4-M5 Link project at this location.

The M4-M5 Link project would however generate some ground-borne noise impact associated with the construction of the mainline tunnel. Based on a progression rate of around 20 metres per week for the excavation using roadheaders, potential ground-borne noise impacts are predicted in the vicinity of the St Peters interchange, west of Sydney Park, where the tunnel ramps climb to meet St Peters stub tunnels. It is predicted that 39 receivers in NCA49 and NCA50 would experience noise levels above the ground-borne noise NML for up to 19 days for each roadheader. Ground-borne noise levels of up to around 44 dBA $LA_{eq(15minute)}$ are predicted when tunnelling equipment is located at the shortest slant distance to the receiver.

The airborne noise emissions from the Campbell Road civil and tunnel site (C10) at St Peters in most circumstances are much higher than the ground borne noise levels. For this reason, ground-borne noise is not anticipated to be the controlling factor for these works.

General ground based noise impacts from tunnelling

The design of the project has sought to maximise tunnel depths wherever possible so as to minimise ground-based noise and vibration impacts during construction. However, due to unavoidable constraints such as the need for the tunnels to meet surface portals and the avoidance of certain geological conditions or other infrastructure in certain locations, tunnelling is proposed at shallower depths in some locations where ground-based noise or vibration would be perceptible and may exceed the noise management levels. The potential for such exceedances would be further investigated during detailed design and reasonable and feasible management measures would be considered. These may include:

- Validation of predicted ground-borne noise levels (note that this may not be required at all receiver)
- Notification letterbox drops to receivers in the area around the works locations, detailing work activities, time periods over which these will occur, impacts and mitigation measures
- Specific notifications provided to receivers where the ground-borne noise levels are predicted to exceed the night-time NML, providing additional information when relevant and more specific information than covered in general letterbox drops.

Detail on the ground-borne noise impacts from tunnelling is provided in Chapter 5 of Appendix J (Technical working paper: Noise and vibration) of the EIS and further detail is provided in Annexure G to this report. This outlines that during tunnelling ground-borne noise may be audible at certain times for properties under which shallow tunnels are being driven using roadheaders or rockbreakers. It should be noted that this noise would be transient only and would dissipate over the course of the progression of the tunnel.

C10.6 Vibration impacts from construction works

275 submitters raised concerns about vibration impacts from surface construction works. Refer to section 10.3 of the EIS and Chapter 5 of Appendix J (Technical working paper: Noise and vibration) of the EIS for details of potential noise and vibration impacts during construction.

C10.6.1 General vibration impacts

Submitters raised concerns about vibration impacts from construction generally. Specific areas of concern included:

- Vibration impacts on more than 450 receivers including at least five childcare centres and a primary school from 24 hour a day underground tunnelling
- Vibration during construction affecting homes on Terry Street, Rozelle and throughout Rozelle
- Soil and subsurface conditions have a strong influence on ground-borne vibration with vibration propagation being more efficient in stiff clay soils and that shallow rock concentrates vibration energy close to the surface and can result in vibration problems large distances away from the source. Layering of soil can also have significant effects. These conditions are what many inner west houses are founded on and so vibration impacts from the construction of the project would be worsened
- General concern for construction ground-borne noise associated with drilling
- Concern that with the current design, up to 229 buildings (and therefore the residents within) will be within the minimum working distance of vibration intensive equipment
- Concern about the noise and vibration impacts of a large rockbreaker machinery which might be used in the Darley Road construction site on the five buildings identified in the EIS which would be within the minimum working distance from the site.

Submitters have also raised general concerns in relation to vibration impacts from construction activities on residents, building foundations, Rozelle Public School, Haberfield Public School and The Crescent Early Learning Centre. Specific concerns relate to the increased vibration from civil sites, the use of jackhammers and rockbreakers and as a result of demolition works at the Darley Road site and other construction ancillary facilities.

Response

At various locations throughout the project it would be necessary to use vibration intensive plant such as rockbreakers. The use of such equipment would be temporary and would be largely undertaken early in the program for surface activities. The EIS has assessed the potential for vibration impacts upon human comfort and cosmetic damage to buildings and has outlined the number and location of properties likely to be affected. This assessment is based upon vibration-intensive equipment being used within minimum safe working distance of buildings. In practice this equipment would move around the site as works progress, spending only short periods in close proximity to adjacent residential and commercial buildings. As such the overall impact upon residents and property would be limited.

Vibration can take the form of disturbing human comfort, affecting building contents or damaging the integrity of a building structure.

Based on expected plant and equipment to be used during surface work, the key vibration generating equipment are expected to be a vibratory roller and a rockbreaker. This equipment has the potential to exceed:

- The human response vibration criterion within up to 100 metres (vibratory roller) and 73 metres (large rockbreaker)
- The cosmetic damage criterion within up to 25 metres (vibratory roller) and 22 metres (large rockbreaker).

The predicted vibration levels for the locations assessed are representative of the worst case impacts where surface works are undertaken. For most construction activities, it is expected that the vibration from surface construction activities would frequently be lower than predicted at the most-exposed receiver as the levels presented in this report are based on a realistic worst case assessment for when equipment is operating at the shortest distance to the receiver.

Potential impacts to human receivers and non-heritage listed buildings

Some residential receivers may be within, safe working distances (minimum distances within which vibration impacts may occur) for vibration generating equipment during construction. This has the potential to result in impacts on human comfort and potentially cosmetic structural damage.

Receivers adjacent to the construction areas may perceive vibration impacts during active construction work in their immediate vicinity. This might be expected when equipment such as rockbreakers and other high vibration plant items such as vibratory rollers are operating. While vibration impacts would be felt before cosmetic damage occurs, in practice, vibration impacts from most construction activities would be intermittent throughout the construction period. The locations where vibration intensive equipment is proposed to be used would be reviewed during detailed design when more specific information is available.

A summary of the expected vibration impacts at each surface construction site is as follows:

- Haberfield – Option A - No vibration intensive work is proposed at the Haberfield Option A sites as part of the M4-M5 Link project. If vibration intensive works are required, a site specific vibration assessment should be undertaken by the design and construction contractor(s) prior to the commencement of works
- Haberfield – Option B - Up to 22 buildings may be within the minimum working distance for cosmetic building damage, should a large rockbreaker be used at the outer extent of the site. Up to 66 receivers would be within the nominated minimum working distance for human comfort
- Darley Road - Up to five buildings may be within the minimum working distance for cosmetic building damage, should a large rockbreaker be used at the outer extent of the site. Up to 74 receivers would be within the nominated minimum working distance for human comfort
- Rozelle - Up to 124 buildings may be within the minimum working distance for cosmetic building damage, should a large rockbreaker be used at the outer extent of the site. Up to 345 receivers would be within the nominated minimum working distance for human comfort
- Iron Cove -Up to 45 buildings (including properties in Terry Street considered in NCA34 and NCA35) may be within the minimum working distance for cosmetic building damage, should a large rockbreaker be used at the outer extent of the site. Up to 107 receivers would be within the nominated minimum working distance for human comfort
- Pyrmont Bridge Road -Up to 33 buildings may be within the minimum working distance for cosmetic building damage, should a large rockbreaker be used at the outer extent of the site. Up to 73 receivers would be within the nominated minimum working distance for human comfort
- St Peters - No vibration intensive works are proposed at the Campbell Road civil and tunnel site C10) as part of the M4-M5 Link project. If vibration intensive works are required, a site specific vibration assessment should be undertaken by the design and construction contractor(s) prior to the commencement of works.

Potential impacts to heritage structures and buildings

The following is a summary of heritage listed buildings and structures that have been assessed as having the potential to be affected by vibration generated by the project:

- Haberfield – Option A - No vibration intensive work is proposed from the Haberfield Option A sites as part of the M4-M5 Link project.
- Haberfield – Option B - No heritage listed items have been identified as having the potential to be within a distance whereby cosmetic damage may occur if a large rockbreaker is used at the outer (nearest) extents of this site
- Darley Road - One heritage listed item has been identified as having the potential to be within a distance whereby cosmetic damage may occur if a large rockbreaker is used at the outer (nearest) extents of this site
- Rozelle - Up to 19 heritage listed items have been identified as having the potential to be within a distance whereby cosmetic damage may occur if a large rockbreaker is used at the outer (nearest) extents of this site

- Iron Cove - No heritage listed items have been identified as having the potential to be within a distance whereby cosmetic damage may occur if a large rockbreaker is used at the outer (nearest) extents of this site
- Pyrmont Bridge Road - Up to five heritage listed items have been identified as having the potential to be within a distance whereby cosmetic damage may occur if a large rockbreaker is used at the outer (nearest) extents of this site
- St Peters - No vibration intensive work are proposed from the St Peters site (Campbell Road civil and tunnel site (C10) as part of the M4-M5 Link project.

Influence of soil and geological conditions

Propagation of vibration emitted from a source is site specific with the level of vibration potentially experienced at a receiver dependent upon the vibration energy generated by the source, the predominant frequencies of vibration, the localised geotechnical conditions and the interaction of structures and features which can dampen vibration.

While the ground dampening characteristics may vary between the ground types likely to be found in the study area (understood to largely comprise sandstone and shale), this is expected to have negligible effect on the vibration predicted at the relatively short distances to the nearest receivers. It should be noted that the source frequency can change with different ground types and local site conditions should be considered further during the detailed design.

Vibration impacts on schools and child care centres

As noted in Appendix J (Technical working paper: Noise and vibration) of the EIS, the minimum working distances for vibration intensive plant varies substantially depending on the equipment and the specific threshold (cosmetic damage or human response). For all equipment likely to be employed for the project the human response distance is less than 100 metres. For the most common equipment such as jackhammers and roadheaders this distance is seven metres. As such the potential for impacts upon education facilities such as Rozelle Public School, Haberfield Public School and The Crescent Early Learning Centre is very low because these receivers are in excess of 100 metres from the proposed construction footprint.

Vibration mitigation measures

Vibration impacts would be managed in accordance with relevant guidelines and design and construction contractor(s) procedures. This would include monitoring of vibration-intensive activities likely to exceed relevant criteria. See **Chapter E1** (Environmental management measures) for details of how vibration impacts would be managed during construction of the project.

Should construction works be required within minimum working distances, the following measures are proposed to manage vibration impacts:

- Validation of predicted vibration levels at the nearest receiver buildings to the vibration intensive works
- Use of alternative method to de-couple load path/equipment that generates less vibration where feasible and reasonable
- Notification letterbox drops to receivers in the area around the works locations, detailing work activities, time periods over which these will occur, impacts and mitigation measures
- Respite periods may be offered to the affected residents during works where vibration intensive plant levels are predicted to be operated within the safe working distance for human comfort for an extended period of time on any one day.

Location and activity specific noise and vibration impact assessments will be carried out prior to works commencing for activities that have the potential to exceed relevant performance criteria for vibration.

The assessments will clarify predicted impacts at relevant receivers in the vicinity of the activities to assist with the selection of appropriate management measures, consistent with the requirements of ICNG and CNVG that will be implemented during the works.

C10.7 Construction noise from out-of-hours work

1,072 submitters raised concerns about construction noise impacts from out-of-hours work. Refer to section 10.3 of the EIS for details of potential noise and vibration impacts during construction.

C10.7.1 Out-of-hours construction work (non-specific)

Submitters have raised concerns regarding noise impacts from construction work being undertaken outside of standard construction hours. Specific concerns relate to the following:

- Night time noise is an unacceptable impact of the project and would be highly disruptive to residents, particularly at Haberfield and Leichhardt given the mitigation offered to residents during M4 East construction has not been adequate
- Noise impacts from after-hours works including utilities works and concrete sawing will cause sleep disturbance, particularly around the Rozelle Rail Yards site
- Objection to ongoing 24 hour industrial scale activity in the midst of residential areas
- Concern about night-time works including spoil handling occurring at the Darley Road civil and tunnel site, with 371 homes being affected by noise sufficient to cause sleep disturbance
- Concern for 24 hour noise near Rozelle Public School and Haberfield Public School
- Concern that civil construction during normal daytime hours will be extended into late night work when the schedule has fallen behind, as has been experienced by residents of Haberfield and St Peters in the construction of preceding stages
- Generation of 24 hour construction noise levels of 75 dBA would cause many residents to sell or find alternative accommodation
- Concerns that night-time noise from construction will be highly disruptive to children's sleep patterns if living within 500 metres of a construction site
- Concerns for out-of-hours construction work at Pyrmont Bridge Road tunnel site. Specific concerns relate to the use of the rockbreaker for two weeks, which will cause high noise impacts to at least 14 receivers
- The conditions of approval allow discretion for undertaking night and weekend work. Contractors often overrun notified working hours, fail to notify residents and different agencies and often do not coordinate out-of-hours work
- Contractors would only have to notify local residents, businesses and the NSW EPA about works outside standard daytime construction hours. These parties have no right to limit these works
- Concern about night-time works across all project sites causing noise impacts sufficient to cause sleep disturbance for 1,599 residents.

Response

In developing construction methodologies and a construction program for the project, the aim has been to minimise the duration of the construction period while maintaining an acceptable and manageable amenity outcome for surrounding receivers. This has required a balance between the duration and intensity of construction activities and the ability to reasonably and feasibly maintain impacts within acceptable limits. This process is ongoing and further opportunities to reduce the duration of construction while minimising impacts to local amenity would be considered during the detailed design phase.

Tunnelling would be undertaken 24 hours per day, seven days per week for the project to reduce the duration of the impacts associated with tunnelling. Surface works would be carried out during standard construction hours wherever possible to minimise the potential for disturbance outside standard construction hours. It should be noted however that certain aspects of construction activities cannot be undertaken during standard construction hours. For example, Transport for NSW's Traffic Management Centre is unlikely to permit roadworks on main roads such as City West Link and Victoria Road during the day, and as such construction would only be able to be undertaken out-of-hours.

Out-of-hours construction hours includes both evening and night-time construction hours. Evening hours are 6.00 pm to 10.00 pm Monday to Sunday. Night-time hours are 10.00 pm to 7.00 am Monday to Friday and 10.00 pm to 8.00 am Saturday, Sunday and public holidays.

Works undertaken outside of standard construction hours have the potential for noise exceedances and the noise assessment also indicates that the sleep disturbance screening criterion is likely to be exceeded at various locations when night-time work is occurring in close proximity to some residential receivers. Given the nature of the construction works, these impacts are unavoidable. The project would aim to minimise such impacts through the application of standard and, if necessary, additional mitigation measures, as outlined in section 4.6 of Appendix J (Technical working paper: Noise and vibration) of the EIS. It is recognised however that these measures may not ameliorate all noise impacts upon all sensitive receivers for all works.

For most construction activities, it is expected that the actual construction noise level would generally be lower than the wost-case prediction made at the most-exposed receiver. This is because noise level varies with position of plant item or noise sensitive receiver as well as across different stages of construction.

Out-of-hours noise is not considered likely to affect the operation of Rozelle Public School and Haberfield Public School as these would typically only be in use during school hours on school days. There is the potential for night works to disrupt the sleep of students that live in the vicinity of where night works would be undertaken.

An out-of-hours work protocol would be developed as part of the project-wide CNVMP to set parameters around how work outside standard construction hours would be carried out. This would include timing and frequency of specific construction activities and an outline of the mitigation measures that would be implemented based on predicted impacts identified through location and activity specific noise and vibration assessments. The out-of-hours work protocol would be developed in consultation with DP&E and the NSW EPA and is expected to form a requirement of the project's EPL.

The protocol would include:

- Details of work required outside standard construction hours, including justification of why the activities are required outside standard construction hours
- Measures to be implemented to manage potential impacts associated with work outside standard construction hours
- Location and activity specific noise and vibration impact assessment process(es) that will be followed to identify potentially affected receivers, clarify potential impacts and select appropriate management measures
- Details of the approval process for work proposed outside standard construction hours
- Detail on actions to be taken, such as consultation with, and notification of, sensitive receivers, in the event that unforeseen out-of-hours works is required.

Further detail of the noise management measures are provided in **Chapter E1** (Environmental management measures). Works outside standard construction hours will be regulated by the NSW EPA through a project EPL. The NSW EPA typically restrict the number of nights per week on which works that are likely to generate noise levels above noise management levels can be undertaken.

While every effort would be made to ensure all works programmed for standard construction hours are undertaken as scheduled there may be times where unforeseen out-of-hours work is required, such as during an emergency. Depending on the nature of the works required, the out-of-hours work protocol would be implemented in order to manage the impact of the works. It is however recognised that in certain cases, such as during emergency works, these protocols may not be able to be fully implemented. In these cases reasonable and feasible measures would be implemented to manage noise impacts.

It is recognised that out-of-hours construction noise remains a particular concern for residents and other sensitive receivers in the proximity of the M4 East and New M5 construction sites. The M4-M5 Link project has sought to understand the nature of these impacts and the specific concerns of receivers in these locations. Accordingly the M4-M5 Link project has provided additional measures in order to prevent or mitigate these impacts. This includes the provision of a Utilities Management Strategy which aims to coordinate utility works and assess the range of potential environmental impacts associated with utility works, including cumulative impacts, to outline a range of mitigation measures which would be applied to minimise the potential environmental impacts and to outline a process for how utility works that are not assessed as part of the EIS would be managed.

A suitably qualified and experienced Acoustics Advisor, who is independent of the design and construction personnel, will be engaged for the duration of construction of the project. The responsibility of the Acoustics Advisor would include but not be limited to reviewing proposals regarding works outside standard construction hours, confirming that the works are appropriate and endorsing the proposed mitigation measures (see environmental management measure NV1 in **Chapter E1** (Environmental management measures) for further information).

Monitoring will be carried out at the commencement of activities for which a location and activity specific noise and vibration impact assessment has been prepared to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the management measures that have been implemented are appropriate (see environmental management measure NV6 in **Chapter E1** (Environmental management measures) for further information).

C10.7.2 Tunnelling activities at night-time

Submitters have raised general concerns in relation to out-of-hours construction noise generated by tunnelling. Specific concerns included:

- Concerns that tunnelling noise during the night for three weeks or longer would affect many residents
- Specific concerns relate to tunnelling excavation at the Parramatta Road West civil and tunnel site
- 24 hours a day tunnelling close to Rozelle Public School with only a few hours of respite
- Concern that the specific management strategy for addressing impacts associated with ground-borne noise will be documented in the out-of-hours work protocol which the community will have no opportunity to comment on.

Response

The EIS has assessed the potential for noise and vibration impacts arising from tunnel construction activities under or near to residents. It is predicted that a total of 84 residential receivers would be subject to ground-borne noise impacts above the night-time criterion of 35 dBA $L_{Aeq(15minute)}$ during the tunnelling across all surface construction sites.

Tunnelling is proposed to be undertaken 24 hours a day, seven days a week in order to reduce the overall duration of the construction of the project and the associated duration of impacts on affected communities. Considering the method of tunnel excavation proposed for the project (refer to section 6.4.4 of the EIS) it is also optimal that tunnel excavation be undertaken continuously for structural integrity and safety reasons.

Ground-borne noise impacts from the construction of the access tunnel at the Parramatta Road West Civil site are assessed in section 5.1.9 of Appendix J (Technical working paper: Noise and vibration) of the EIS. In NCA01, where the construction access tunnel ramp dives down from ground elevation to meet with the main line tunnel, sensitive receivers above this section are predicted to be subject to ground-borne noise levels up to around 53 dBA $L_{Aeq(15minute)}$, which exceeds the both the evening and night-time criteria. Based on a progression rate of around 20 metres per week, the most affected sensitive receivers are likely to experience noise levels above the night-time criterion for up to around 20 days.

During construction it is likely that works in certain locations near tunnelling and ancillary sites would generate night time noise such that exceedances of night time noise criteria are incurred at nearby residences. This would include the exceedance of sleep disturbance criteria across several locations. It should be noted that the construction noise assessment prepared for the EIS is based upon the concept design and would be further refined at the detailed design stage. At this point it is expected that specific construction layouts and specific construction equipment would be defined in more detail. This would allow for a more accurate assessment of noise impacts to be undertaken and provides a potential opportunity to reduce the overall number of predicted exceedances without mitigation. At this stage the project would also be able to apply additional mitigation measures so as to manage the impact of such exceedances. This may include consultation with impacted sensitive receivers, the offer of respite periods or alternative accommodation as relevant.

As detailed in section 5.7 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Rozelle Public School in NCA 31 would not be affected by ground-borne noise or vibration during tunnelling of the mainline tunnel or Iron Cove Link due the school's distance from the alignment of these tunnels (greater than 30 metres slant distance).

An out-of-hours work protocol will be developed as part of the project wide CNVMP to set parameters around how work outside standard construction hours would be carried out, including timing and frequency, and the mitigation measures that would be implemented based on predicted impacts identified through location and activity specific assessments. The out-of-hours work protocol would be developed in consultation with DP&E and the NSW EPA and reflected in the project's EPL.

Further assessment of the predicted night-time ground-borne noise arising from construction of the mainline and access tunnels would be undertaken at the detailed design stage and would be based on detailed construction methodology. Where exceedances of the criterion are identified further noise mitigation measures would be considered.

C10.7.3 24 hour construction traffic noise

Submitters have raised general concerns in relation to traffic noise generated by 24 hour construction, including that 24 hour tunnelling activities would include the use of heavy vehicles travelling along roads through the night, which would disturb the sleep of local residents already stressed by the project. Specific concerns included:

- Concern for 24 hour noise from construction vehicles at the northern extent of Annandale
- Concern for 24 hour noise from construction vehicles and spoil haulage at the proposed combination of construction facilities at Haberfield, referred to as Option B. Specific concerns relate to the Parramatta Road West civil and tunnel site (C1b)
- Concern for noise generated by late night traffic movements at the Darley Road civil and tunnel construction site
- Concern for the increase in noise at night from heavy vehicle movements and reversing alarms in the vicinity of the Rozelle Rail Yards.

Response

The project aims to undertake tunnelling 24 hours per day so as to minimise the overall duration of construction, including associated noise impacts. The prompt removal of spoil is essential to allow the excavation of the tunnel to progress efficiently, given the limited space within the tunnels and inside the acoustic sheds for storage. Spoil haulage is therefore required 24 hours per day, seven days per week at the civil and tunnel sites (Wattle Street civil and tunnel site (C1a), Haberfield civil and tunnel site (C2a), Parramatta Road West civil and tunnel site (C1b) and the Rozelle civil and tunnel site (C5)). Spoil haulage from the Darley Road civil and tunnel site would be restricted to standard construction hours only (7.00 am to 6.00 pm Monday to Friday and 8.00 am to 1.00 pm Saturdays) so as to minimise noise disruptions to local residents from heavy vehicle movements.

It should be noted that concrete and shotcrete deliveries to the construction ancillary facilities would also be required 24 hours per day, seven days per week, as the excavated tunnel would be progressively supported behind the roadheader by applying shotcrete to the excavated tunnel walls. These deliveries would still take place at Darley Road during the night, despite a restriction on the movement of spoil haulage heavy vehicles at this time.

The EIS has assessed the noise impact arising from the movement of additional heavy and light construction vehicles travelling along roads in the vicinity of ancillary facilities during construction, including both daytime and night impacts. The additional noise generated by these movements was modelled and assessed with reference to the existing background traffic levels on these roads at the relevant times of day. This assessment indicated that the additional noise from construction traffic on these routes would not increase existing traffic noise levels by more than 2 dBA as per guidance in Roads and Maritime's RNP for any of the routes assessed (including around Annandale). As such these traffic movements would not be perceptible above the existing road traffic noise.

Despite this, where spoil haulage is carried out outside of standard construction hours, work practices and mitigation measures consistent with the requirements of the ICNG, would be implemented. This would include scheduling of movement, especially late night vehicle movements past sensitive receptors. As far as feasible and reasonable, spoil haulage from construction ancillary facilities during the evening and night-time periods would be confined to arterial roads such as City West Link, Darley Road, Wattle Street, Pyrmont Bridge Road, Parramatta Road, Campbell Road and the Princes Highway. Spoil haulage routes would also utilise the M4 East and New M5 tunnels one the respective projects are operational. Spoil haulage would not be permitted on local roads and spoil haulage routes would be identified, documented in the CTAMP and communicated to all spoil haulage drivers.

The CTAMP and site inductions would cover instructions for operation of vehicles entering and leaving the sites in order to minimise noise. This would include the use of non-tonal reversing alarms as necessary. Heavy vehicle marshalling areas, where required, will be located in suitable locations, in order to minimise noise impacts on any sensitive receivers in the vicinity. A truck marshalling facility is proposed at the White Bay Civil site (C11) (see **Chapter D2** (White Bay civil site (C11))). The White Bay Civil site (C11) would accommodate around 50 additional construction workforce parking spaces, as well as provide a truck marshalling area for around 40 heavy vehicles.

C10.8 Construction noise and vibration management measures

2,003 submitters raised concerns about the construction noise and vibration management measures. See **Chapter E1** (Environmental management measures) for details on the noise and vibration environmental management measures.

C10.8.1 Concerns regarding noise management measures

Submitters raised general concerns with the scope and extent of the noise and vibration management measures during construction. Concerns included:

- Noise mitigation measures are lacking
- Concerns whether construction noise mitigation measures will be implemented
- The EIS did not provide sufficient detail regarding the management measures which would be employed during construction, including management measures for:
  - Night-time construction work
  - Tunnelling noise during the night, for three weeks or longer
  - Airborne noise near Rozelle Public School
  - Noise and vibration impacts on heritage houses in the Rozelle interchange construction zone
- Concern that mitigation measures such as acoustic sheds and noise walls are not sufficient to ensure shift workers will not be impacted by construction noise
- Site hoarding is not an effective noise control
- Submitters expressed their concerns that the acoustic sheds proposed are not suitable to adequately manage noise impacts
- The EIS is vague as to how mitigation will be carried out and has no requirement that measures will in fact be implemented to address noise impacts. The approval conditions need to contain specific noise mitigation measures that can be mandated and enforced
- The EIS does not contain specific plans for noise mitigation which are left to be developed in the future by a construction company

- The EIS is vague and non-committal when detailing noise mitigation measures including limiting heavy vehicle movements and offers of compensation for noise impacts. The EIS has a heavy reliance on the “reasonable and feasible” clause in the NSW EPA’s noise policy to evade its responsibility
- Concern over the claim that some noisy activities lasting only for a couple of weeks should be granted a more lenient noise criteria believing this is not justified
- The EIS does not require acoustic sheds and states that they be implemented where ‘reasonable and feasible’ only
- Rejects the EIS using language such as ‘considering’ when discussing noise controls which effectively equates to a ‘do nothing’ option. Concern over the EIS not providing precision or detail
- The EIS does not provide details of the CNVMP
- Concern that the policy for mitigation entitlements such as noise protection or respite accommodation is not transparent
- The noise impacts of construction are not able to be mitigated to an acceptable level
- The conditions of approval are insufficient as they nearly always allow discretion on the part of the contractor to undertake out-of-hours work and do not require contractors to notify residents of out-of-hours work
- Concern that the demolition of buildings along Lilyfield Road (which block sound generated by nearby roads) will not be mitigated by having adequate construction noise mitigation measures. The EIS does not provide details of noise walls
- Concern that residents in Rozelle will be affected by construction noise sufficient to cause sleep disturbance even if acoustic sheds and noise walls are used. While the EIS promises negotiation to provide more mitigation on a one by one basis, concerns have been raised about the effectiveness of these mitigation measures. Those with less bargaining power or social networks will be left more exposed. Concern that construction noise mitigation measures at Rozelle and elsewhere will not be adequate
- Concern that residents at Catherine Street, Johnston Street and The Crescent will be subject to excessive construction noise and have not been offered adequate noise management controls
- Concern that no mitigation measures are proposed to protect residents from construction noise at Camperdown
- Concern that the effectiveness of proposed enhancements to selected areas of the Pyrmont Bridge Road site for noise management are not detailed in the EIS nor noise mitigation measures in general
- Concern that promises of potential mitigation are not enough, particularly when considering the ongoing noise impacts in Haberfield during the M4 East construction
- The EIS does not provide detail on management measures for cumulative impact of prolonged periods of construction noise from the M4 East and New M5 projects
- Questions over what mitigation measures will be used to control noise outside normal business hours given spoil handling will occur 24/7
- Concern that the noise management measures are not reasonable and feasible as there are no details in the EIS regarding the noise management measures
- Concern for the high number of residents in both Haberfield and Leichhardt who would require mitigation for unacceptable night time noise
- Concern that noise mitigation would be worse for residents and students in Rozelle as the Iron Cove Link sites are 100 metres away from Rozelle Public School and the construction site in King George Park is 10 metres from homes and open space
- How would noise impact generated by trucks entering, exiting and queuing around construction sites be mitigated?

- Instructing individuals to stay indoors at affected properties with doors and windows shut as the primary noise mitigation measure proposed during construction is unreasonable for a construction period of up to five years
- Concern the noise and vibration assessment in the EIS does not state the requirement of acoustic sheds/barriers at the access tunnel entrances, and only states that they should be implemented where feasible and reasonable to minimise potential noise impacts associated with out-of-hours works within the tunnels.

Response

A comprehensive construction and vibration impact assessment has been completed for the EIS. The assessment has been undertaken in accordance with the SEARs and the ICNG. As part of the assessment, noise modelling was undertaken to predict noise levels resulting from the construction of the project at surrounding receiver locations. For most construction activities, it is expected that the actual construction noise level would generally be lower than the wost-case prediction made at the most-exposed receiver. This is because noise level varies with position of plant item or noise sensitive receiver as well as across different stages of construction.

In developing construction methodologies and a program for the project, the aim was to minimise the duration of the construction period while minimising impacts to local amenity as far as is practical. This has required a balance between the duration and intensity of construction activities and the ability to reasonably and feasibly maintain impacts within acceptable limits This process is ongoing and further opportunities to reduce the duration of construction while maintaining protecting local amenity would be considered during the detailed design phase. Where exceedances of construction noise management levels are expected both within and outside standard construction work hours, the ICNG and CNVG recommend strategies for noise mitigation and control.

A CNVMP will be prepared for the project (see environmental management measure NV2 in **Chapter E1** (Environmental management measures). The plan will:

- Identify relevant performance criteria in relation to noise and vibration
- Identify noise and vibration sensitive receivers and features in the vicinity of the project
- Include standard and additional mitigation measures from the CNVG and details about when each will be applied
- Describe the process(es) that will be adopted for carrying out location and activity specific noise and vibration impact assessments to assist with the selection of appropriate mitigation measures
- Include protocols that will be adopted to manage works required outside standard construction hours in accordance with relevant guidelines
- Detail monitoring that will be carried out to confirm project performance in relation to noise and vibration performance criteria.

The CNVMP will be implemented for the duration of construction of the project. As outlined above, the CNVMP would include standard mitigation measures as well as any project-specific mitigation measures, as required. These may include:

- Project management activities: community consultation or notification, site inductions and staff behavioural practices, noise and vibration monitoring and verification and updating of environmental management plans, as required
- Source controls: selection of construction hours, scheduling and respite periods; use and siting of plant, equipment selection and management; minimising disturbance from goods deliveries; blasting regime
- Path controls: shield stationary noise sources such as pumps, compressors and fans, shield sensitive receivers from noisy activities (for example shrouding and hoarding)
- Receptor controls.

Refer to Table 4-13 of Appendix J (Technical working paper: Noise and vibration) of the EIS for further information regarding standard mitigation measures. The actual mitigation measures implemented would be selected by the design and construction contractor(s) based on the detailed construction methodology and the particular potential impacts at each work location/time.

Location and activity specific noise and vibration impact assessments will be carried out prior to (as a minimum) activities:

- With the potential to result in noise levels above 75 dBA at any receiver
- Required outside standard construction hours likely to result in noise levels greater than the relevant noise management levels
- With the potential to exceed relevant performance criteria for vibration.

The assessments will clarify predicted impacts at relevant receivers in the vicinity of the activities to assist with the selection of appropriate management measures, consistent with the requirements of the ICNG and CNVG, that will be implemented during the works (see environmental management measure NV4 in **Chapter E1** (Environmental management measures).

Appropriate combinations of these mitigation measures have been proposed in the EIS, based upon the level of detail known at the concept design stage and the construction methodology. Further consideration would be given to mitigation measures, both generally and specifically, once a detailed design is available for the project.

Mitigation measures relating to night-time construction, night-time tunnelling and impacts upon heritage houses near Rozelle Interchange would include a range of both ‘standard’ and ‘additional’ measures as outlined in section 4.6 of Appendix J (Technical working paper: Noise and vibration) of the EIS. Additional noise assessments would be carried out as required to outline specific noise and vibration impacts based upon finalised construction plans. This stage would specifically investigate locations where exceedances are predicted and would identify as appropriate a mix of mitigation measures to these locations to manage these impacts.

While still following the recommendations and process outlined in the ICNG and CNVG, this method allows for a ‘performance based’ approach to noise mitigation during construction. This approach identifies risk areas, outlines noise management goals and then allows the design and construction contractor(s) and proponent to work together to find the most reasonable and feasible methods for meeting these goals. In applying this approach the project allows for innovative and improved methods for managing noise to be implemented.

A suitably qualified and experienced Acoustics Advisor, who is independent of the design and construction personnel, will be engaged for the duration of construction of the project (see environmental management measure NV1 in **Chapter E1** (Environmental management measures). The Acoustics Advisor will be responsible for:

- Reviewing management plans related to noise and vibration and endorsing that they address all relevant conditions of approval and requirements of all applicable guidelines
- Reviewing location and activity specific noise and vibration impact assessments prepared during the project and endorsing the assessments and proposed mitigation measures
- Reviewing proposals regarding works outside standard construction hours, confirming that the works are appropriate and endorsing the proposed mitigation measures
- Monitoring noise and vibration from construction generally and:
  - Confirming that actual noise and vibration levels and impacts are consistent with predictions
  - Confirming that reasonable and feasible noise and vibration mitigation measures are being implemented
  - Suggesting additional reasonable measures to further reduce impacts
- Monitoring and providing advice in relation to compliance with conditions of approval and project commitments related to noise and vibration
- Providing advice in relation to complaints regarding noise and vibration impacts that cannot be resolved between the complaint and the project
- Reviewing and endorsing the proposed operational noise controls, the associated noise model and the proposed implementation program.

Consultation would occur with all sensitive receivers likely to experience elevated noise levels, including schools, and specific noise impacts would be considered and addressed where reasonable and feasible.

Should the project be approved, the conditions of this approval are expected to include requirements for the management of noise in accordance with relevant guidance. These requirements, in addition to the commitments made in the EIS and the processes set out in the CNVMP, are expected to be sufficient to suitably manage construction noise impacts arising from the project.

The noise and vibration impact assessment provides an outline of the predicted noise levels for all relevant noise-generating construction scenarios. These scenarios are discussed in the context of their proposed duration noting that shorter duration impacts (a few weeks) are likely to be more acceptable to sensitive receivers than longer term impacts. The assessment does not, nor does it suggest that, shorter duration scenarios should be subject to any different noise impact criteria.

The terminology used in the EIS is that mitigation measures should be 'considered' for implementation based upon the outcome of the detailed design and what is deemed to be reasonable and feasible at each specific location. This term is used on the basis that not all mitigation measures are likely to be appropriate for all scenarios or locations. For example, a noise wall may provide good noise attenuation but may not be appropriate in a certain location as it might lead to poor design outcomes, reduced connectivity, overshadowing or public safety issues. As such the use of the term 'consider' indicates that the project would make informed decisions on a case by case basis to balance several (sometime competing) objectives with view to achieving the best overall outcome for the community and the project. As described above, the Acoustics Advisor for the project will be responsible for reviewing the implementation of noise mitigation measures.

The use of site hoarding (height of two metres and four metres) has been designated for all construction ancillary facilities associated with the project. Site hoarding has been demonstrated to attenuate construction noise for those receivers that would otherwise be in line of sight to noisy activities. This measure would however, form part of a suite of measures aimed at eliminating, reducing or managing noise impacts associated with construction.

Individual consultation would be triggered by substantial exceedances in the construction noise levels, which would provide an opportunity for the project to better understand issues such as impacts to shift workers and to allow mitigation measures to be tailored accordingly. As indicated in Appendix G (Draft Community Consultation Framework) of the EIS, meetings would be held with stakeholders near construction ancillary facilities and work sites, especially residents, schools and businesses, to understand their needs and manage these in a reasonable manner. These meetings would be held in an open and transparent manner and would seek to provide optimal outcomes for all members of the community, not just those with bargaining power or existing social networks. Prior notification would also be provided for all construction activities and any planned out-of-hours work.

Where feasible and reasonable, acoustic sheds would be provided at construction ancillary facilities to reduce the impact of noise-generating activities at all times, including outside standard construction hours, with view to complying with relevant noise goals where reasonable and feasible. While the use of acoustic sheds is not a mandatory part of the project, the design and construction contractor(s) would need to meet certain noise performance measures which may be best accomplished through the use of these sheds. It should also be noted that works exceeding noise management level outside standard construction hours would be regulated through an EPL. It will be in the best interest of the design and construction contractor(s) to design and construct acoustic sheds that ensure that noise levels from the activities occurring within comply with relevant night-time noise management levels, otherwise those activities will be subject to restriction through the EPL, including the number of night per weeks that the acoustic sheds can be used.

Acoustic sheds will be designed with consideration of the activities that will occur within them and the relevant noise management levels in adjacent areas. Monitoring will be carried out to confirm that the actual acoustic performance of each shed is consistent with predicted acoustic performance (see environmental management measure NV7 in **Chapter E1** (Environmental management measures).

As summarised in section 10.5 of the EIS, a suite of mitigation and management measures in addition to acoustic sheds were identified for potential ambient noise and vibration impacts during construction and operation. Additional temporary noise mitigation measures may include noise barriers and other temporary structures such as site buildings, which would be positioned to minimise effects from noise on surrounding properties. These management measures are summarised in **Chapter E1** (Environmental management measures).

The proponent would retain responsibility for the implementation of noise mitigation measures, particularly those outlined within conditions of approval. Compliance will be assessed through project environmental auditing.

Appendix J (Technical working paper: Noise and vibration) and section 26.4.3 of the EIS recognises that residents of St Peters and Haberfield have already been subject to construction noise impacts from the New M5 and M4 East projects respectively. The report also discusses the potential for extended impacts at these locations as a result of the construction of the M4-M5 Link. The assessment outlines the importance of community consultation in this regard, as well as the implementation of noise source, path and receiver controls and management measures. See **section B11.11.3** for further information regarding ongoing construction impacts at Haberfield for the project.

Noise predictions in the EIS have been based upon the concept design only and are considered to be conservative for the purposes of indicating the number, location and type of noise exceedances. As the project is at the concept design though much of the final detail of the specific location of works and the type of equipment to be used is not yet fully known. As such noise mitigation measures, beyond standard measures such as construction hoarding, have not been provided for specific locations. Instead a list of typical noise mitigation measures consistent with the CNVG have been suggested for implementation at this stage.

Further information on construction noise mitigation and environmental management measures is provided in **Chapter E1** (Environmental management measures).

In Haberfield and Leichhardt construction activities would be undertaken in locations that are close to existing residential properties. In certain locations and during certain parts of the construction program this is likely to lead to night time noise exceedances. Such impacts would be assessed in further detail at the detailed design stage. Where reasonable and feasible noise mitigation measures would be implemented in line with the CNVG to manage these impacts.

Rozelle Public School is located within NCA31 and nearby the Iron Cove Link civil site (C8) construction area assessed in the EIS. The site boundary is located approximately 140 metres from the nearest boundary of Rozelle Public School. During higher noise generating activities, such as during roadworks, it is predicted that the school would be subject to up to 75 dBA noise levels, resulting in exceedances of the NML by up to 20 dBA. Generally the NML exceedances arising in this noise catchment area would be temporary and attributable to the intermittent use of noisy plant items such as concrete saws and rockbreakers. These items would not operate continuously through the construction period, with most operation being early in the program when the removal of existing concrete or excavation is required. Noisy items of plant would also move around the work site and as such the worst case predicted impacts would only occur when the plant items are in close proximity to the school. It should also be noted that the buildings closest to the works would also provide a degree of noise shielding for those behind such that noise impacts across the majority of the site would be much lower than the predicted worst case. During the construction of the ventilation facility noise impacts are not predicted to exceed the NML for education facilities, or any of the 'other sensitive receiver' categories. This includes the nearby Rozelle Public School.

The project would seek to mitigate noise impacts in Iron Cove and Rozelle through the application of standard and additional mitigation measures, including those around Rozelle Public School. This would include elements such as community consultation and respite periods, as appropriate and as per the Roads and Maritime *Noise Mitigation Guideline.*

During operation, it is predicted that Rozelle Public School would exceed cumulative limit for road traffic noise. As such classrooms would be eligible for consideration of additional mitigation measures. This could be in the form of low noise pavement, noise barriers, at-property treatments, or a combination of mitigation measures. Should this be confirmed during detailed design it is proposed that these measures be considered for installation early in the construction program to provide a degree of mitigation from both construction and operational noise impacts.

During construction noise impacts are predicted at King George Park during the construction of a wetland and demolition of nearby buildings. The latter element would be most likely to result in noise exceedances however this would be for limited period during the early stages of the program.

The noise associated with the movement of construction vehicles has been assessed within the EIS. In all cases these noise increases would represent less than 1.5 dBA increase to the existing background levels. As such these would generally not be noticeable. A CTAMP would be prepared to manage such movements. This would seek, where practical, to avoid unnecessary movements, restrict most construction traffic to arterial roads, manage idling of vehicles and a range of other noise generating activities. This would also include protocols for entering, exiting and queuing around construction sites with view to minimising noise impacts upon nearby residents.

The EIS does not suggest that individuals remain indoors with doors and windows closed throughout the construction period. Instead the EIS suggests a range of mitigation measures that may be considered at the detailed design phase of the project to avoid, mitigation and manage construction noise impacts throughout the project area.

The EIS has detailed the acoustic benefit an upgraded shed provides, although the final construction of acoustic sheds has not been confirmed as the design and construction contractor(s) would be required to meet certain noise management levels as part of the EPL in any case. By not specifying the type of construction the design and construction contractor(s) is allowed some flexibility in meeting noise management levels in a manner that minimises the overall cost of the project. Ultimately it is likely that the design and construction contractor(s) will seek to implement the best acoustic shielding within these sheds as possible as this is likely to be the most efficient method of achieving the required levels.

If the project is approved, the project conditions of approval will require that the project is carried out generally in accordance with the approved project as described in the EIS and the Submissions and preferred infrastructure report and will be consistent with the conditions of approval and any other requirements of DP&E.

See **section B11.11.3** for further information regarding ongoing construction impacts at Haberfield for the project and the management of these impacts.

C10.8.2 Requests for construction noise management measures

Submitters requested the following noise management measures:

- General request for noise barriers to be considered to mitigate impacts during the construction phase of the project
- Residents in Toelle Street, Rozelle want confirmation and assurance that noise mitigation measures will be implemented
- Residents at Alt Street, Haberfield request that strict conditions be imposed on the design and construction contractor(s) to minimise noise
- Request for all homes, businesses, schools and day-care centres within 500 metres of construction sites to be provided with air-conditioning and/or double glazing, so windows can be kept shut to avoid construction noise
- Request for alternative accommodation and temporary relocation of families living near a construction site, particularly during peak construction periods
- Request for extensive noise mitigation works at Haberfield Public School including air conditioning and glazing. Submitters have also requested a process by which all activity at the Parramatta Road West site must cease if the school indicates the noise impacts are too significant, particularly if Option B is implemented
- There must be agreed rules before the project begins on who is entitled to noise mitigation paid for by Roads and Maritime, such as insulation, double glazing, air conditioning or temporary relocation as has been the practice for the Crossrail project in the UK. This should be published before the project begins
- Request that the mitigation measures for the construction site at Haberfield referred to in the EIS be implemented, namely upgraded acoustic sheds, increased site hoarding and a 110 dBA limit to the internal sound power level if Option B is implemented
- If Parramatta Road (Haberfield) Option B is used, the site should only use mains powered electricity and if generators are to be used for temporary purposes, they must have better acoustic treatment than those used on M4 East sites along Wattle Street, Martin Street, Dobroyd Parade and Waratah Street, Haberfield
- Calls for noise barriers to be as high as five metres at the Parramatta Road East civil site
- Reduction in speed to 40 kilometres per hour along Catherine Street, as well as the installation of speed cameras, to mitigate the noise impacts from construction vehicles passing over speed humps

- There are 36 homes identified as having severe noise impacts during construction at Leichhardt and Lilyfield. Concern that the acoustic shed proposed is an inadequate quality. Request for the highest grade acoustic sheds and additional noise mitigation such as noise walls
- The conditions of approval for the project should include clear mitigation strategies to ensure that ground-borne noise does not exceed NML 35 dBA outside business hours for extended periods at Rozelle, for example, by increasing tunnel depths to 25-35 metres
- Residents in Rozelle have requested protection from noise during construction, particularly near Rozelle Public School and with reference to construction works between Springside Street and Iron Cove Bridge. Regular respite periods must be observed which are of sufficient length and not impacted by the operation of other utilities
- A submitter requested that residents affected on Springside and Callan streets, Rozelle are offered acoustic insulation to mitigate increased traffic noise from proposed construction site on Victoria Road, between Springside Street and Iron Cove Bridge
- Submitters queried whether alternative living arrangements and/or compensation have been considered for residents in close proximity to the Pyrmont Bridge Road tunnel site
- Request that as a condition of approval, there be no commencement of works, including utility works, unless mitigation measures are available, ready and in place
- The proponent should be required to extend the number of properties compulsorily acquired where residents are subjected to noise pollution which exceeds the guidelines
- As a minimum, acoustic treatment must be provided to all residential properties where construction noise levels are 10 dBA or more above project specific noise levels and if not practicable to provide acoustic treatment, a generous monetary compensation must be provided
- Recommends improvements to acoustic sheds through thicker steel sheeting, thicker insulation, double entry door systems and reverberation control. Submitters suggested that the proposed acoustic sheds are of the lowest grade and will not entirely cover the construction sites. Submitters requested that the highest grade of noise protection and acoustic sheds be mandated and provided to entirely cover the construction sites, including the tunnel and site entrances and exits. Their design and other additional noise mitigation measures should be provided to the community for comment
- The project should use movable acoustic sheds when saw cutting is required
- Spoil haulage and heavy vehicle movements should occur only during routine construction hours across all sites to minimise disruption, as is planned for the Darley Road site (Monday to Friday 7.00 am to 6.00 pm, Saturday 8.00 am to 1.00 pm)
- After hours works should obtain Roads and Maritime/ Transport Management Centre (TMC) road occupancy permit for works between 7.00 pm and 11.00 pm and no road or utility works should take place after 11.00 pm except in the case of emergencies
- A night time curfew for all work after 11.00 pm must be imposed to match the airport curfew and allow breaks from works for residents
- There should be no use of off road diesel equipment such as diesel generators due to noise impacts
- Any licences granted by the DP&E shouldn't reflect the standards of those issued for Stages 1 and 2 of WestConnex and must:
  - Be of a standard that significantly reduces noise (and vibration) impacts compared to Stages 1 and 2 of WestConnex
  - Have no allowance for Roads and Maritime to circumvent contractor compliance for out-of-hours work directions
  - Ensure the provision of the highest grade acoustic sheds on entrances and exits as well as spoil handling areas and any other amelioration measure to lessen impacts
- Mobile sound walls closer to the source, sound blankets or mobile cages, acoustic covering of jet fans and ventilation equipment should be used to provide better baffling than what was experienced with the M4 East. The New M5 also used shipping containers as sound walls near the airport

- Roads and Maritime should mandate noise limits from engine compression brakes and use roadside noise monitoring to aid enforcement at every location heavy vehicles associated with WestConnex may affect nearby communities
- Noise monitoring systems should be installed at locations (including near the Parramatta Road civil sites and the Pyrmont Bridge Road site) to monitor external noise from construction activities
- Concrete sawing works should only be undertaken during the day as the decibel (dB) rating for the work is unacceptable and the noise would travel up to 100 metres. There should be a dB cap placed on noise from night works
- Penalties should be imposed by the NSW EPA for exceeding noise levels during construction
- Residents in Rozelle have requested protection from noise during construction, including the installation of sound barriers, particularly near Rozelle Public School and with reference to construction works between Springside Street and Iron Cove Bridge. Regular respite periods must be observed which are of sufficient length and not impacted by the operation of other utilities
- The Darley Road civil and tunnel site should not be permitted to operate outside of standard construction hours because of the noise impacts from construction vehicles, delivery vehicles and worker transportation vehicles
- Submitters proposed that all residents adjacent to the heavy vehicle access route be re-homed for the full duration of the construction works at the cost of Roads and Maritime/SMC.

Response

Table C10-4 Response to requests for construction noise environmental management measures

Request	Response
General request for noise barriers to be considered to mitigate impacts during the construction phase of the project	Noise barriers have been considered throughout the project for the purposes of mitigating operational noise arising from the project. The installation of full noise walls during construction however have not been considered feasible based upon several factors including impact on connectivity, cost, constructability, duration of construction and impacts upon urban design and visual amenity. Construction hoarding would however be installed around all proposed construction sites to minimise noise and views of active construction. Neither permanent noise walls or temporary construction hoarding are likely to substantially reduce the degree of dust generation or its movement into adjacent public and private properties and have not been considered for this purpose. For a discussion on potential impacts from dust during construction see **section C9.3**.

Request	Response
Residents in Toelle Street, Rozelle want confirmation and assurance that noise mitigation measures will be implemented	Toelle Street at Rozelle would be subject to construction noise arising from works at the Iron Cove Link civil site (C8) on Victoria Road. Construction noise from this site would affect residents at the Victoria Road end of Toelle Street to the greatest degree, though this would be mitigated through the use of standard construction mitigation measures such as site hoarding and the planning of construction traffic movements to avoid more sensitive periods such as at night-time, where feasible. This would be further supplemented by the commitments in the CNVMP. During operation it is predicted that parts of Rozelle around the northern end of Toelle Street would be subject to increases in noise. As such properties in this area would be eligible for consideration of additional mitigation measures such as the use of low noise pavement, noise barriers or at-property treatments. Should this be confirmed during detailed design it is proposed that these measures be considered for installation early in the construction program to provide a degree of mitigation from both construction and operational noise impacts.
Residents at Alt Street, Haberfield request that strict conditions be imposed on the design and construction contractor(s) to minimise noise	Design and construction contractor(s) undertaking construction of the project would be subject to the project's overall conditions of approval as well as the commitments made in the EIS. This includes a requirement for the development and implementation of management plans relating to construction traffic and noise, amongst others. These would be developed on the basis of detailed noise modelling undertaken on the detailed design, once it is available. These management plans will include strict performance requirements and will be audited throughout construction to measure compliance.
Request for all homes, businesses, schools and day-care centres within 500 metres of construction sites to be provided with air-conditioning and/or double glazing, so windows can be kept shut to avoid construction noise	The use of at-property treatments is not considered to be a suitable method of construction noise mitigation based upon the varying nature of such noise throughout the construction period. However certain properties around construction sites, such as those at Iron Cove, may be eligible for consideration of additional operational mitigation measures such as the use of low noise pavement, noise barriers or at-property treatments. Should this be confirmed during detailed design it is proposed that these measures be considered for installation early in the construction program to provide a degree of mitigation from both construction and operational noise impacts.
Request for alternative accommodation and temporary relocation of families living near a construction site, particularly during peak construction periods	Section 4.6 of the Appendix J (Technical working paper: Noise and vibration) of the EIS outlines a range of standard and additional measures to be considered for implementation to manage noise impacts during construction. This includes the provision of alternative accommodation in certain cases. The need for this measure would be assessed on a case by case basis after other measures have been consulted upon and/or implemented.

Request	Response
Request for extensive noise mitigation works at Haberfield Public School including air conditioning and glazing. Submitters have also requested a process by which all activity at the Parramatta Road West site must cease if the school indicates the noise impacts are too significant, particularly if Option B is implemented	Construction noise impacts at Haberfield Public School are discussed in **section C10.3.3**. Management measures relating to noise and vibration would be outlined in the CNVMP to be prepared as part of the detailed design phase. This plan would provide protocols for the avoidance of noise impacts where feasible and reasonable. Based on the generally low degree of predicted noise exceedances at this school (about 5 dBA) it is not envisaged that these protocols would include provision for stopping works if or when these impacts occur.
There must be agreed rules before the project begins on who is entitled to noise mitigation paid for by Roads and Maritime, such as insulation, double glazing, air conditioning or temporary relocation as has been the practice for the Crossrail project in the UK. This should be published before the project begins	Roads and Maritime's *Noise Mitigation Guideline* outlines the process by which noise mitigation is applied to specific projects. This policy has formed the basis of the Noise and vibration impact assessment and would be further considered as part of noise mitigation in response to detailed design.
Request that the mitigation measures for the construction site at Haberfield referred to in the EIS be implemented, namely upgraded acoustic sheds, increased site hoarding and a 110 dBA limit to the internal sound power level if Option B is implemented If Parramatta Road (Haberfield) Option B is used, the site should only use mains powered electricity and if generators are to be used for temporary purposes, they must have better acoustic treatment than those used on M4 East sites along Wattle Street, Martin Street, Dobroyd Parade and Waratah Street, Haberfield	The specific mitigation measures applied the construction ancillary facility at Haberfield would be confirmed once the detailed design has been prepared and supplementary noise impact assessment undertaken. The project would aim to connect mains electricity to construction ancillary facilities early in the program to avoid the need to use diesel generators. However this may not be possible or practical at all sites and as such diesel generators may need to be used. In these cases the project would apply noise source mitigation measures, as proposed within the Appendix J (Technical working paper: Noise and vibration) of the EIS (section 5.8.1). This includes the careful siting of plant, use of mobile acoustic enclosures or the use of localised hoarding around noise generating plant items as appropriate. The need for such items would be confirmed at the detailed design stage and would be subject to advice from the independent Acoustics Advisor for the project.
Calls for noise barriers to be as high as 5 metres at the Parramatta Road East civil site	Appendix J (Technical working paper: Noise and vibration) of the EIS proposed that all site hoarding be increased from the standard two metres to four metres in height. This height may be increased further in certain locations should the additional height be demonstrated to provide a reasonable noise benefit to nearby sensitive receivers.
Reduction in speed to 40 km/h along Catherine Street, as well as the installation of speed cameras, to mitigate the noise impacts from construction vehicles passing over speed humps	Project-related heavy vehicles are not expected to use Catherine Street during construction, however light vehicles may use Lilyfield Road and Catherine Street. Speed limits would be determined by Roads and Maritime or Inner West Council.

Request	Response
There are 36 homes identified as having severe noise impacts during construction at Leichhardt and Lilyfield. Concern that the acoustic shed proposed is an inadequate quality. Request for the highest grade acoustic sheds and additional noise mitigation such as noise walls	While the project would take all steps to mitigate ground borne noise as far as is reasonable and feasible it is likely that there would remain exceedances of the 35 dBA noise management level for a number of sensitive receivers. This is due to factors including the fixed entry points for tunnels, geotechnical conditions, vertical separation from other tunnels and maintaining appropriate grades for traffic. The project would however seek to mitigate these impacts through the application of standard and additional mitigation measures, including community consultation and notification.
Submitter believes that the conditions of approval for the project should include clear mitigation strategies to ensure that ground-borne noise does not exceed NML 35 dBA outside business hours for extended periods at Rozelle, for example, by increasing tunnel depths to 25-35 metres	The project would seek to mitigate noise impacts in Iron Cove and Rozelle through the application of standard and additional mitigation measures, including those around Rozelle Public School. This would include elements such as community consultation and respite periods, as appropriate and as per the Roads and Maritime *Noise Mitigation Guideline*. See above for further information.
Residents in Rozelle have requested protection from noise during construction, particularly near Rozelle Public School and with reference to construction works between Springside Street and Iron Cove Bridge. Regular respite periods must be observed which are of sufficient length and not impacted by the operation of other utilities A submitter requested that residents affected on Springside and Callan streets, Rozelle are offered acoustic insulation to mitigate increased traffic noise from proposed construction site on Victoria Road, between Springside Street and Iron Cove Bridge	The project would seek to mitigate noise impacts in Iron Cove and Rozelle through the application of standard and additional mitigation measures, including those around Rozelle Public School. This would include elements such as community consultation and respite periods, as appropriate and as per the Roads and Maritime *Noise Mitigation Guideline*. See above for further information.
Submitters queried whether alternative living arrangements and/or compensation have been considered for residents in close proximity to the Pyrmont Bridge Road tunnel site	As per the Roads and Maritime *Noise Mitigation Guideline* certain standard and additional noise mitigation measures would be considered for certain areas depending on the nature of the construction noise impacts predicted. The use of alternative accommodation is one of the additional mitigation measures that would be considered. At this stage no monetary compensation for noise impacts is proposed.
Request that as a condition of approval, there be no commencement of works, including utility works, unless mitigation measures are available, ready and in place	The conditions of approval would be prepared by DP&E and are not set by the project. The project has however committed to ensuring that noise from all project-related works are mitigated as far as is practical. Environmental management measures would be implemented prior to the commencement of relevant construction works.

Request	Response
The proponent should be required to extend the number of properties compulsorily acquired where residents are subjected to noise pollution which exceeds the guidelines	The project has sought to minimise the number of properties acquired for the project so as to avoid impacts upon individuals, families and communities in general. At present it is not proposed to acquire properties on the basis of noise impact. The project would however consider the application of all standard and additional mitigation measures as appropriate at all areas where construction noise exceeds noise management levels.
As a minimum, acoustic treatment must be provided to all residential properties where construction noise levels are 10 dBA or more above project specific noise levels and if not practicable to provide acoustic treatment, a generous monetary compensation must be provided	As per the Roads and Maritime *Noise Mitigation Guideline* standard and additional noise mitigation measures would be considered for certain areas depending on the nature of the construction noise impacts predicted. In certain cases properties affected by construction noise may also qualify for consideration of operational noise mitigation measures such as architectural treatment. Where this is confirmed during detailed design it is proposed that these measures be considered for installation early in the construction program to provide a degree of mitigation from both construction and operational noise impacts. At this stage no monetary compensation for noise impacts is proposed.
Recommends improvements to acoustic sheds through thicker steel sheeting, thicker insulation, double entry door systems and reverberation control. Submitters suggested that the proposed acoustic sheds are of the lowest grade and will not entirely cover the construction sites. Submitters requested that the highest grade of noise protection and acoustic sheds be mandated and provided to entirely cover the construction sites, including the tunnel and site entrances and exits. Their design and other additional noise mitigation measures should be provided to the community for comment	The design and materials used in the construction of acoustic sheds would be confirmed at the detailed design stage. This would take into account the likely noise scenarios within the sheds, as well as the predicted impacts upon nearby sensitive receivers and the application of other standard and additional noise mitigation measures. This would include consultation with the community concerning predicted noise impacts as well as measures proposed to manage the impacts, including the use of acoustic sheds. It should be noted that it is in the best interests of the design and construction contractor(s) to design and install that highest quality acoustic shed to assist with compliance with night-time noise management levels. If this was not achieved then the project EPL may restrict the number of nights per week that the design and construction contractor(s) can use the shed, which would directly affect their program and increase their costs.
The project should use movable acoustic sheds when saw cutting is required	A variety of noise source mitigation measures have been proposed for further consideration within the Appendix J (Technical working paper: Noise and vibration) of the EIS. This includes the careful siting of plant, use of mobile acoustic enclosures or the use of localised hoarding around noise generating plant items as appropriate. The need for such items would be confirmed at the detailed design stage and would be subject to advice from the independent Acoustics Advisor for the project.

Request	Response
Spoil haulage and heavy vehicle movements should occur only during routine construction hours across all sites to minimise disruption, as is planned for the Darley Road site (Monday to Friday 7.00 am-6.00 pm, Saturday 8.00 am-1.00 pm)	The project is expected to generate substantial volumes of spoil during tunnelling activities. It is not considered viable or necessary to restrict the haulage of this spoil to standard working hours for all construction sites. If implemented this would substantially increase the overall duration of construction and extend the duration of project-related noise impacts upon residents and businesses. It should also be noted that the majority of tunnelling sites are located in close proximity to major arterial roads such as Parramatta Road and City West Link. Restricting out-of-hours construction traffic on these roads is unlikely to provide any noticeable benefit given the high existing background traffic noise levels.
After hours works should obtain Roads and Maritime/ Transport Management Centre (TMC) road occupancy permit for works between 7:00 pm and 11:00 pm and no road or utility works should take place after 11:00 pm except in the case of emergencies	All roadworks requiring the occupation of active lanes would seek a road occupancy licence from the NSW Traffic Management Centre prior to works commencing. While every effort would be made to restrict noisy works to less disruptive times it will be necessary for the project to undertake certain works late at night (beyond 11.00pm). In these cases the project would apply standard and, if necessary, additional mitigation measures to manage these impacts.
A night time curfew for all work after 11:00 pm must be imposed to match the airport curfew and allow breaks from works for residents	As outlined above, every effort would be made to restrict noisy works to less disruptive times it will be necessary for the project to undertake certain works late at night. In these cases the project would apply standard and, if necessary, additional mitigation measures to manage these impacts.
There should be no use of off road diesel equipment such as diesel generators due to noise impacts Any licences granted by the DP&E shouldn't reflect the standards of those issued for Stages 1 and 2 of WestConnex and must: • Be of a standard that significantly reduces noise (and vibration) impacts compared to Stages 1 and 2 of WestConnex • Have no allowance for Roads and Maritime to circumvent contractor compliance for out-of-hours work directions • Ensure the provision of the highest grade acoustic sheds on entrances and exits as well as spoil handling areas and any other amelioration measure to lessen impacts	The project would aim to connect mains electricity to construction ancillary facilities early in the program to avoid the need to use diesel generators. However this may not be possible or practical at all sites and as such diesel generators may need to be used. In these cases the project would apply noise source mitigation measures, as proposed within section 5.8.1 of Appendix J (Technical working paper: Noise and vibration) of the EIS. This includes the careful siting of plant, use of mobile acoustic enclosures or the use of localised hoarding around noise generating plant items as appropriate. The need for such items would be confirmed at the detailed design stage and would be subject to advice from the Acoustics Advisor for the project.

Request	Response
Mobile sound walls closer to the source, sound blankets or mobile cages, acoustic covering of jet fans and ventilation equipment should be used to provide better baffling that what was experienced with the M4 East. The New M5 also used shipping containers as sound walls near the airport	As per the Roads and Maritime *Noise Mitigation Guideline* certain standard and additional noise mitigation measures would be considered for certain areas depending on the nature of the construction noise impacts predicted. This would include the implementation of noise source mitigation measures, as proposed within the Appendix J (Technical working paper: Noise and vibration) of the EIS. This includes the use of mobile acoustic enclosures or the use of localised hoarding around noise generating plant items as appropriate. The need for such items would be confirmed at the detailed design stage and would be subject to advice from the Acoustics Advisor for the project.
Roads and Maritime should mandate noise limits from engine compression brakes and use roadside noise monitoring to aid enforcement at every location heavy vehicles associated with WestConnex may affect nearby communities	The limiting of engine compression braking in residential areas forms part of the standard mitigation measures to be applied to construction, as per the Roads and Maritime *Noise Mitigation Guideline*. This would also be included in the CNVMP for the project.
Noise monitoring systems should be installed at locations (including near the Parramatta Road civil sites and the Pyrmont Bridge Road site) to monitor external noise from construction activities	The CNVMP would further outline the monitoring proposed to confirm project performance in relation to noise and vibration performance criteria.
Concrete sawing works should only be undertaken during the day as the dB rating for the work is unacceptable and the noise would travel up to 100 metres. There should be a dB cap placed on noise from night works	While every effort would be made to restrict noisy works to less disruptive times it will be necessary for the project to undertake certain works late at night (beyond 11.00pm). In these cases the project would apply standard and, if necessary, additional mitigation measures so as to manage these impacts.
Penalties should be imposed by the NSW EPA for exceeding noise levels during construction	The project would be constructed under an EPL that is likely to specify noise limits under certain scenarios. This EPL would be prepared and enforced by the NSW EPA and would include penalties in cases where noise limits are unjustifiably exceeded.

Request	Response
Residents in Rozelle have requested protection from noise during construction, including the installation of sound barriers, particularly near Rozelle Public School and with reference to construction works between Springside Street and Iron Cove Bridge. Regular respite periods must be observed which are of sufficient length and not impacted by the operation of other utilities	During construction noise impacts are predicted at Iron Cove. This includes impacts upon nearby residents and Rozelle Public School. The project would seek to mitigate these noise impacts through the application of standard and additional mitigation measures, including around Rozelle Public School. This would include elements such as community consultation and respite periods, as appropriate and as per the Roads and Maritime *Noise Mitigation Guideline*. During operation, it is predicted that Rozelle Public School would exceed cumulative limit for road traffic noise. As such classrooms would be eligible for consideration of additional mitigation measures. This could be in the form of low noise pavement, noise barriers, at-property treatments, or a combination of mitigation measures. Should this be confirmed during detailed design it is proposed that these measures be considered for installation early in the construction program to provide a degree of mitigation from both construction and operational noise impacts.
The Darley Road civil and tunnel site should not be permitted to operate outside of standard construction hours because of the noise impacts from construction vehicles, delivery vehicles and worker transportation vehicles	The project has committed to restricting the movement of spoil haulage vehicles to within standard construction hours only. It is however noted that other heavy vehicles such as deliveries may still occur outside of these times. The project would seek to mitigate other noise impacts at this location through the application of standard and additional mitigation measures. This would include elements such as community consultation and respite periods, as appropriate and as per the Roads and Maritime *Noise Mitigation Guideline*. The restriction of all construction activity to within standard construction hours at this site would substantially increase the overall duration of construction noise impacts at this location due to the extended time needed to complete the works.
Submitters proposed that all residents adjacent to the heavy vehicle access route be re-homed for the full duration of the construction works at the cost of Roads and Maritime/SMC	The additional noise generated by construction traffic on routes to be used by project heavy vehicles has been assessed for each construction site in Appendix J (Technical working paper: Noise and vibration) of the EIS. This assessment indicates that this additional construction-related traffic would not increase overall traffic noise on these routes to a noticeable degree. That is, noise increases on these routes would remain below a 2 dBA increase on existing background levels, as per guidance in Roads and Maritime's RNP.

C10.8.3 Concerns and requests regarding construction noise management measures for Darley Road civil and tunnel site (C4)

Submitters were concerned with the proposed environmental management measures to mitigate construction noise from the Darley Road civil and tunnel site (C4). In particular the following concerns were raised:

- There is no clear plan for measures that will be taken to minimise noise impacts
- Concerns relating to the noise generated from the demolition of the existing building at the Darley Road site and the lack of management plan or mitigation measures specified in the EIS to address these noise concerns
- Concern that the EIS does not detail or propose any temporary relocation, noise walls nor any mitigation to individual homes near the Darley Road site

- Concern that residents near the Darley Road site will be affected by construction noise sufficient to cause sleep disturbance even if acoustic sheds and noise walls are used and that other mitigation measures will also be ineffective. Adjacent streets mentioned included Francis Street, Hubert Street and Charles Street
- The EIS states that acoustic barriers and devices at the access tunnel entrances would be considered and implemented where reasonable and feasible and does not require them
- Submitter requested information on noise considerations planned for passengers waiting at the Rozelle Bay light rail station
- Requests for blanket prohibition of heavy vehicle movements and worker contractor parking on local streets near the site to control against additional noise impacts
- Clarification on if the 10 heavy vehicles entering the intersection will avoid travelling in the early mornings to avoid impacting residents
- Concern the proposed acoustic shed will not operate effectively and that it is unclear in the EIS whether the use of the highest level of acoustic protection by the contractor will be mandated by the proponent
- Request for a sound barrier at the Darley Road civil and tunnel site
- Mitigation should be considered for receivers who experience noise exceedances. If measures are not implemented, spoil handling within the site should be prohibited
- Conditions of any approval should be stringent and should require the proponent to pay a pre-determined amount of ex gratia payment to residents for each night of disturbance.

Submitters also suggested a range of additional environmental management measures to manage potential noise impacts at the Darley Road civil and tunnel site, including measures to manage potential out-of-hours construction noise impacts.

Response

The noise and vibration assessment has been prepared on the basis of implementing only minor mitigation measures, such as the increased height of site hoarding to four metres. A long list of further standard and additional mitigation measures are proposed for inclusion as per the Roads and Maritime *Noise Mitigation Guideline*. The assessment has not committed the project to the specific implementation of these measures as the project is still at the concept design stage and subject to changes during detailed design. The project's construction noise impacts would be reassessed once the detailed design is confirmed and specific mitigation measures would be applied at this point.

The assessment of noise impacts at the Darley Road civil and tunnel site has been prepared on the assumption that two metre site hoarding and an acoustic shed would be implemented at this site. As outlined above, a range of other standard and additional mitigation measures are available to be implemented at this site such as increased hoarding height and higher performing acoustic sheds. The requirement for these measures would be confirmed once a detailed design is available. These measures would form part of the CNVMP and would be enforced through this mechanism, in accordance with likely conditions of consent and/or the project's EPL.

The EIS identifies up to 118 receivers during pavement and infrastructure works that have potential to exceed the sleep disturbance noise management level along Darley Road and parts of nearby cross streets. The construction scenarios with greater than 20 dBA exceedances of the sleep disturbance NML would last up to three weeks only. As indicated in the Appendix G (Draft Community Consultation Framework) of the EIS, meetings would be held with stakeholders near construction ancillary facilities and work sites, especially residents and businesses, to understand their needs and manage these in a reasonable manner. These meetings would be held in an open and transparent manner and would seek to provide optimal outcomes for all members of the community, not just those with bargaining power or existing social networks. Prior notice would also be provided for all construction activities and any planned out-of-hours work.

The project's construction noise impacts would be reassessed once the detailed design is confirmed and specific mitigation measures would be applied at this point. These would be drawn from a long list of further standard and additional mitigation measures as per the CNVG.

Noise mitigation measures for passengers waiting at Rozelle bay light rail station have not been considered as part of the EIS. This is on the basis that the duration of occupancy at this location is expected to be short and that commuters are not expected to be as sensitive to noise impacts.

As outlined in the EIS all project-related heavy vehicles routes would be on arterial roads. In certain cases, such as during emergencies, these vehicles would be required to make use of certain local roads. This scenario is expected to be very infrequent.

Due to the size constraints for construction ancillary facilities it would not be possible to accommodate all construction parking within these facilities. As such some degree of parking on nearby streets is likely to be required. The project aims to minimise this however through the use of off-site and off-street construction car parking utilising shuttle buses to transport workers to the ancillary facilities. A CTAMP will be prepared as part of the CEMP and will describe a car parking strategy for construction staff at the various worksites and ancillary facilities (see environmental management measures TT01 and TT04 in **Chapter E1** (Environmental management measures) for further information regarding the CTAMP and car parking strategy).

With the exception of the Darley Road civil and tunnel site (C4) construction heavy vehicles would operate 24 hours a day. At Darley Road, spoil haulage vehicles would only operate during standard construction hours, though it is noted that other heavy vehicles such as deliveries may still occur outside of these times.

The design and materials used in the construction of acoustic sheds would be confirmed at the detailed design stage. This would take into account the likely noise scenarios within the sheds, as well as the predicted impacts upon nearby sensitive receivers and application of other standard and additional noise mitigation measures. This would include consultation with the community concerning predicted noise impacts as well as measures proposed to manage the impacts, including the use of acoustic sheds.

The relevant environmental management measures listed in **Chapter E1** (Environmental management measures) would be included in a CNVMP which would apply to the Darley Road civil and tunnel site (C4) and would be prepared in accordance with the ICNG and CNVG and in consultation with relevant stakeholders such as the NSW EPA. The CNVMP for the project would be made publicly available.

The CNVMP would also outline the monitoring proposed to confirm project performance in relation to noise and vibration performance criteria. As per the CNVG (Roads and Maritime 2016) certain standard and additional noise mitigation measures would be considered for certain areas depending on the nature of the construction noise impacts predicted.

A suitably qualified and experienced Acoustics Advisor, who is independent of the design and construction personnel, will be engaged for the duration of construction of the project (see environmental management measure NV1 in **Chapter E1** (Environmental management measures). The Acoustics Advisor will be responsible for:

- Reviewing management plans related to noise and vibration and endorsing that they address all relevant conditions of approval and requirements of all applicable guidelines
- Reviewing location and activity specific noise and vibration impact assessments prepared during the project and endorsing the assessments and proposed mitigation measures
- Reviewing proposals regarding works outside standard construction hours, confirming that the works are appropriate and endorsing the proposed mitigation measures
- Monitoring noise and vibration from construction generally and:
  - Confirming that actual noise and vibration levels and impacts are consistent with predictions
  - Confirming that reasonable and feasible noise and vibration mitigation measures are being implemented
  - Suggesting additional reasonable measures to further reduce impacts
- Monitoring and providing advice in relation to compliance with conditions of approval and project commitments related to noise and vibration
- Providing advice in relation to complaints regarding noise and vibration impacts that cannot be resolved between the complaint and the project
- Reviewing and endorsing the proposed operational noise controls, the associated noise model and the proposed implementation program.

During construction the Darley Road civil and tunnel site (C4) would be surrounded by hoarding at a minimum height of two metres. The site would also include an acoustic shed around the tunnel portal in order to reduce off-site noise impacts. The use of permanent noise barriers is typically only considered where operational noise would exceed noise management levels.

Construction noise mitigation measures would be further considered during the detailed design period for residents predicted to incur noise exceedances. These measures would be implemented as far as is feasible and reasonable and would include the restriction of spoil haulage heavy vehicle movements to and from the Darley Road civil and tunnel site (C4) to standard construction hours, as well as the use of an acoustic shed during construction. These measures would not extend to restricting spoil handling within the site as most of this would occur within the acoustic shed. Such a restriction would also extend the overall program of works in this location, leading to an extended duration of noise impacts on residents.

Should the project be approved the conditions of approval provided by the Department of Planning and Environment would be expected to include strict measures around the regulation of construction noise throughout the project. In addition, the project would require an EPL from the NSW EPA. This would include further limits on noise generated by the project. These would be in addition to commitments already made within the EIS and the Submissions and preferred infrastructure report concerning the mitigation of noise impacts. As outlined above, the restriction of out-of-hours construction activities would extend the overall program of works in this location, leading to an extended duration of noise impacts on residents.

C10.8.4 Consultation with affected receivers before commencement of work

Submitters requested additional consultation with residents and businesses affected by noise from the project. Specific requests included:

- An effective complaints investigation process, with associated compensation strategies to be implemented
- More direct consultation with each potentially affected receiver must be undertaken before approval of night-time works to determine whether impacts are acceptable.

Response

Subject to approval a design and construction contractor(s) would be engaged to prepare the detailed design and construct the project. The design and construction contractor(s) and Roads and Maritime would share responsibility for communication and consultation with stakeholders and the community during construction.

Communication and consultation with stakeholders and the community during construction would focus on providing updates on construction activities and program, responding to enquiries and concerns in a timely manner and minimising potential impacts where possible.

During construction, a dedicated community relations team would deliver:

- A detailed Community Communication Strategy (identifying relevant stakeholders, procedures for distributing information and receiving/responding to feedback, and procedures for resolving stakeholder and community complaints during construction and operation)
- Notification letters and phone calls to residents and businesses directly affected by construction work, changes to traffic arrangements and out-of-hours work
- Face-to-face meetings with landowners as needed
- Regular community updates on the progress of the construction program
- Regular updates to the WestConnex website
- Media releases and project advertising in local and metropolitan English language and non-English language newspapers to provide contact information for the project team
- Site signage around construction ancillary facilities
- 24-hour, toll-free project information and complaints line, a dedicated email address and postal address.

A Community Complaints Commissioner that is independent of the design and construction contractor(s) would be appointed during construction works. The Community Complaints Commissioner would review unresolved disputes between the project and members of the public and make recommendation to satisfactorily address complaints, resolve disputes and/or mitigate against occurrence of future complaints or disputes.

C10.8.5 Construction vibration management measures

Submitters requested additional information of measures being taken to reduce vibration impacts relating to the project. Specific concerns and requests include:

- Request for real-time monitoring of vibration along the proposed route available to the community and affected residents, to allow dangerous spikes in vibration to be addressed immediately
- Residents in Rozelle have requested protection from vibration during construction, particularly near Rozelle Public School
- Ongoing vibration monitoring and reporting must be carried out during construction as vibration will likely cause damage to dwellings and buildings in Rozelle and compensation for this damage and rectifications and repairs should be guaranteed
- Concern that individual residents would be left to negotiate with design and construction contractor(s) over vibration mitigation measures and will likely face difficulties when doing so
- Penalties should be imposed by the NSW EPA for exceeding vibration levels during construction.

Response

Vibration impacts would be managed in accordance with the EIS, relevant guidelines and design and construction contractor(s) procedures. In addition to standard mitigation measures proposed in the assessment guidelines, the following measures would be implemented during construction where practicable:

- Equipment would be selected with view to minimising vibration where possible
- A CNVMP would be prepared for the project. The plan would:
  - Identify relevant performance criteria in relation to vibration
  - Identify vibration sensitive receivers and features in the vicinity of the project
  - Include standard and additional mitigation measures from CNVG and details about when each will be applied
  - Describe the process(es) that would be adopted for carrying out location and activity specific vibration impact assessments to assist with the selection of appropriate mitigation measures
  - Include protocols that would be adopted to manage work required outside standard construction hours in accordance with relevant guidelines, such as limiting duration and providing notification and respite periods
  - Detail monitoring that will be carried out to confirm project performance in relation to vibration performance criteria.

  The CNVMP will be implemented for the duration of construction of the project.
- A suitably qualified and experienced Acoustics Advisor, who is independent of the design and construction personnel, will be engaged for the duration of construction of the project (see environmental management measure NV1 in **Chapter E1** (Environmental management measures). The Acoustics Advisor will be responsible for:
  - Reviewing management plans related to noise and vibration and endorsing that they address all relevant conditions of approval and requirements of all applicable guidelines
  - Reviewing location and activity specific noise and vibration impact assessments prepared during the project and endorsing the assessments and proposed mitigation measures
  - Reviewing proposals regarding works outside standard construction hours, confirming that the work are appropriate and endorsing the proposed mitigation measures
  - Monitoring noise and vibration from construction generally and:

    - Confirming that actual noise and vibration levels and impacts are consistent with predictions
    - Confirming that reasonable and feasible noise and vibration mitigation measures are being implemented
    - Suggesting additional reasonable measures to further reduce impacts
  - Monitoring and providing advice in relation to compliance with conditions of approval and project commitments related to noise and vibration
  - Providing advice in relation to complaints regarding noise and vibration impacts that cannot be resolved between the complaint and the project
  - Reviewing and endorsing the proposed operational noise controls, the associated noise model and the proposed implementation program

- Monitoring will be carried out at the commencement of activities for which a location and activity specific noise and vibration impact assessment has been prepared to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the management measures that have been implemented are appropriate (see environmental management measure NV6 in **Chapter E1** (Environmental management measures)
- Vibration trials and/or attended vibration monitoring would be undertaken prior to and during any work proposed within the minimum working distances for cosmetic damage to ensure that levels remain below the criteria
- An Independent Property Impact Assessment Panel will be established prior to the commencement of works with the potential to result in ground movement and settlement or damage due to vibration. The panel will be responsible for:
  - Independently reviewing the building condition survey process and checking that the reports are adequate to assist with any property damage disputes
  - Resolving any property damage disputes
  - Endorsing the Settlement Management Program and monitoring its implementation and ongoing adequacy.

  The panel will include at least one specialist with experience with ground movement and settlement due to excavations (see environmental management measure PL11 in **Chapter E1** (Environmental management measures).
- Building condition surveys will be offered to property owners within the zone of influence of tunnel settlement (50 metres from the outer edge of the tunnels and within 50 metres of surface works) or as otherwise directed by the Independent Property Impact Assessment Panel. Building condition surveys of properties will be carried out prior to the commencement of any project works in the vicinity that have the potential to result in damage to the properties, as identified by the design and construction contractor(s) and confirmed by the Independent Property Impact Assessment Panel. Building condition surveys will be carried out by a structural engineer (see environmental management measure PL10 in **Chapter E1** (Environmental management measures).

The potential for receivers to be affected by the project would be considered further during detailed design of the project, and where relevant, receiver-specific mitigation and management measures would be identified. These would be developed in consultation with the affected receivers.

In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified. Any disputes between a property or infrastructure owners regarding damage and rectification will be referred to the Independent Property Impact Assessment Panel for resolution see environmental management measure PL13 in **Chapter E1** (Environmental management measures). At this stage no additional monetary compensation for vibration impacts is proposed.

When discussing impacts upon individual properties it is appropriate that such discussions occur in private between the design and construction contractor(s) and the owner and/or occupier of that property. These discussions would be based upon the mitigation measured outlined in the EIS, the management measures and protocols in the CNVMP and the relevant CNVIS.

It is recognised that inexperienced or vulnerable members of the community may face additional challenges in discussing the potential for vibration impacts upon their properties with project representatives. To address this all such meetings, whether group discussions or one on one, would be notified sufficiently in advance to allow community members to obtain assistance for the meeting if needed. In addition, the project would provide translators where required.

The project would be constructed under an EPL that is likely to specify noise limits under certain scenarios. This EPL would be prepared and enforced by the NSW EPA and would include penalties in cases where noise limits are unjustifiably exceeded.

C10.9 Level and quality of the operational noise and vibration assessment

654 submitters raised concerns about the level and quality of the operational noise and vibration assessment. Refer to section 10.1 of the EIS for details of the noise and vibration assessment methodology and Appendix J (Technical working paper: Noise and vibration) of the EIS for the further detail on the operational noise and vibration assessment.

C10.9.1 Operational noise and vibration assessment methodology was not adequate (general)

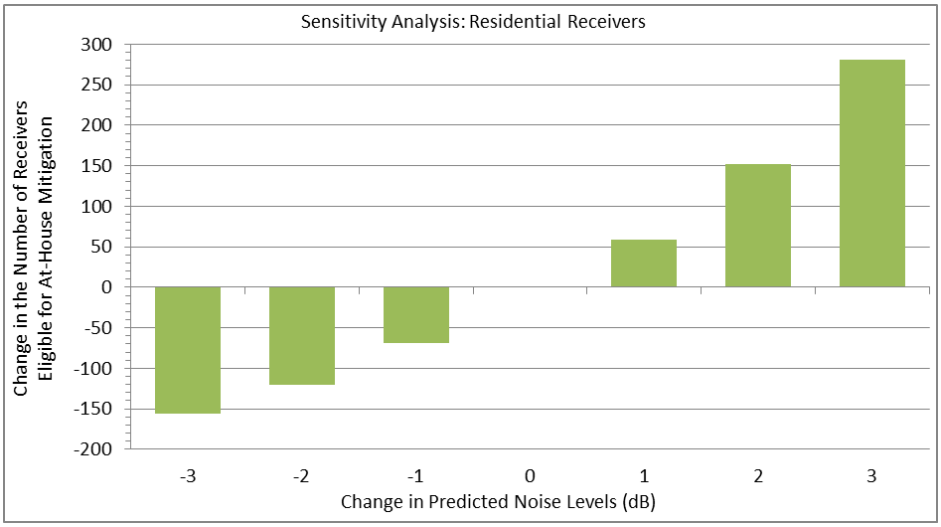
Submitters raised concern regarding the level and quality of the operational noise and vibration assessment. Specific concerns raised were:

- Level of assessment is not adequate
- The accuracy of the traffic analysis (including the WestConnex Road Traffic Model version 2.3 (WRTM v2.3)) has been questioned and is possibly flawed and as the noise studies are based on the traffic analysis, they too may be flawed
- The noise assessment is not evidence based
- Operational noise impacts in the Rozelle interchange area due to a new set of traffic lights have not been considered. These issues are exaggerated by steeper grades
- Noise impacts from ventilation facilities have not been considered, detailed or assessed
- The EIS contains no detail regarding the decibel level of noise emanating from the substation and ventilation facility on the corner of Callan Street and Victoria Road which is likely to exceed allowable levels for a residential area
- The cumulative noise assessment does not appear to include noise from aircraft operations which form a significant part of the ambient noise in many sites impacted by the WestConnex project
- The EIS documents provide octave band noise levels for various fans and substations but these are not sufficient to determine whether a tonal weighting applies and if one does, the noise assessment provided will have understated the noise impact by 5 dBA
- The EIS does not identify or reference any combined operational noise modelling for Haberfield/Ashfield with both the M4 East portals and M4-M5 Link portals in operation
- There is no assessment of the compound noise and vibration effect of multiple tunnels operating under the same property with dampening expected to be inadequate for receivers during operation
- That the noise and vibration assessment has not accounted for soil and subsurface conditions that have a strong influence on the level of ground-borne vibration with the underlying soils within the project footprint being particularly vulnerable due to the abundance of stiff clay
- Concern that the long term vibration impacts from the M4-M5 Link tunnels could impact the linear accelerators and national nuclear reactor that make isotopes for Australia has not been considered
- The noise assessment did not alleviate concerns regarding ongoing noise and vibrations from traffic travelling near homes
- Noise modelling of sensitive receivers along City West Link is required.

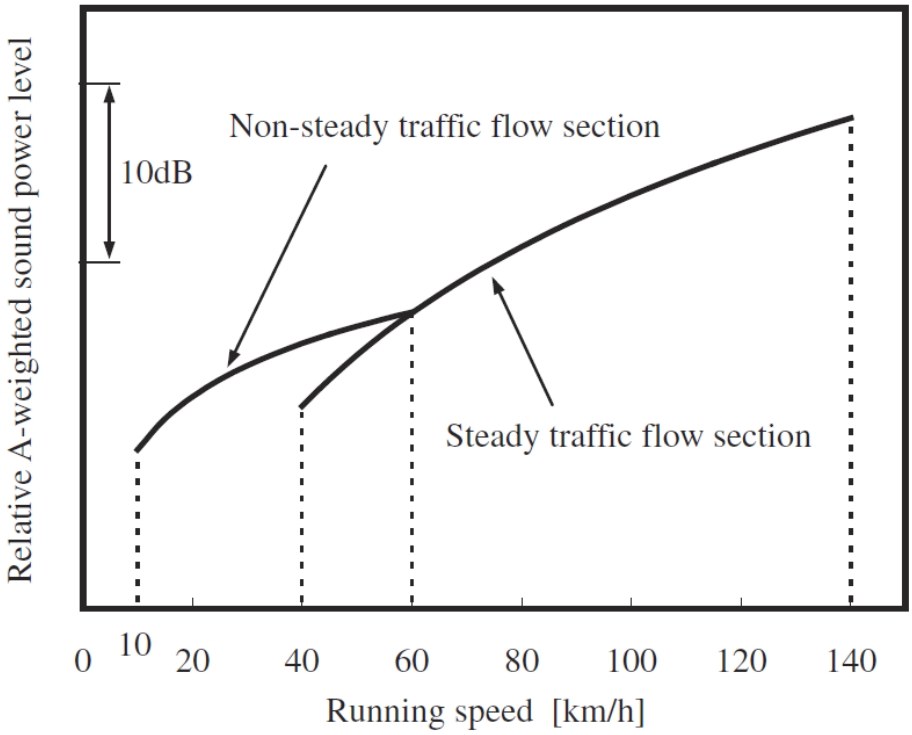
Response

Table C10-5 Response to noise and vibration assessment methodology concerns

Concern or query	Response
Level of assessment is not adequate	The noise and vibration assessment in the EIS included the preparation of a comprehensive technical study prepared by a team of qualified professionals. This technical study was prepared in accordance with the key issues identified in the SEARs which included requirements issued by key government regulatory agencies as well as industry standards and guidelines. The EIS and technical study was reviewed by DP&E to confirm that it adequately addressed the SEARs prior to being placed on public exhibition. The assessment of operational noise and vibration has been undertaken in accordance with a range of relevant guidelines including the CNVG, ICNG and the RNP. The scope of the assessment is comparable to operational noise assessments carried out for other major infrastructure projects, WestConnex M4 East and New M5 projects. Noise model validation was undertaken by comparing measured noise levels to predicted noise levels for the existing roads. Traffic counting was undertaken concurrently with the ambient noise monitoring survey for the purpose of validating the noise model. The noise model predictions were found to be within Roads and Maritime accepted model tolerances (+/- 2 dBA) at all logger locations except for one, R.06, located adjacent to City West Link at the western end of the Rozelle Rail Yards, which was marginally over-predicted due to localised shielding (2.3 dBA daytime and 2.1 dBA night-time).

Concern or query	Response
The accuracy of the traffic analysis (including the WRTM v2.3 model) has been questioned and is possibly flawed and as the noise studies are based on the traffic analysis, they too may be flawed	The operational road traffic noise assessment is based on the most up to date and comprehensive traffic data available at the time of the assessment. The assessment assessed operational traffic noise scenarios which required forecast road traffic volumes. The traffic data utilised in the operational noise model incorporates population and employment projections and growth in demand (regional growth, vehicle trips attracted from competing routes and induced demand as a result of improved travel times). Traffic data for the 'Build' and 'No Build' assessment scenarios for both project opening (2023) and the future year (2033) references the outputs of the strategic traffic model WRTM v2.3. The WRTM v2.3 has been refined and calibrated over several years. This model is based on the current and projected future population growth and land use data and provides robust traffic forecasts which were then used for operational road traffic noise modelling and assessment. The key strategic transport planning model used in the Sydney greater metropolitan area is the Strategic Travel Model (STM), which is managed by Transport for NSW Transport Performance and Analytics. The STM was used as the basis for the project traffic modelling and includes the capability to address future changes in land use trip distribution and mode choice as well as producing vehicle traffic demand during peak and off peak periods. The STM was used as the basis for developing the WRTM which predicts the future growth in road traffic demands for a more detailed transport and pricing scenario traffic model for the project. Traffic demand data used in the operational noise modelling assessment was taken from the WRTM v2.3, following assessment of the model calibration and validation by independent peer reviewers and agreement that the model is suitable for this purpose. See **section C8.11** for further detail on traffic modelling used for the EIS. Further to this, a sensitivity analysis has been undertaken (refer to section 6.7 of Appendix J (Technical working paper: Noise and vibration) of the EIS) on the impact to residential receivers arising from changes in the overall noise levels. This is reproduced in the graphic below.  This chart indicates that an additional 59 receivers would be eligible for consideration of property treatment if a +1 dBA correction were to be added to the noise model predictions. A reduction of 69 receivers would be apparent if 1 dBA was subtracted from the noise model predictions. It was recommended in the EIS that the subsequent operational noise mitigation review that will be undertaken during detailed design adopt, as a minimum, a sensitivity allowance of +1 dBA to account for any uncertainties in the source emission input parameters.

Concern or query	Response
The noise assessment is not evidence based	**Background noise monitoring** Background noise monitoring data used to inform various aspects of the noise impact assessment in the EIS was obtained from noise monitoring locations identified to provide a reasonable and representative characterisation of the background noise environment of those receivers most likely to be affected by noise from the project (see section 3.4 of Appendix J (Technical working paper: Noise and vibration) of the EIS). Attended and unattended noise monitoring surveys were undertaken between July and November 2016 at 23 locations within the study area. These surveys have been supplemented with noise measurements undertaken previously for the M4 East and New M5 projects. Locations, dates and purpose of each background monitoring event are outlined in Table 3-2 of Appendix J (Technical working paper: Noise and vibration) of the EIS. **Noise model validation** The purpose of model validation is to demonstrate that the noise model produced for the existing situation is an accurate representation of the real world within the limitations of the prediction algorithm and to identify errors associated with geospatial data and modelling approach. This is to provide greater confidence in the assessment completed and recommendations made for the project, which would be re-validated and re-run during detailed design. Road traffic noise source emission used in the predictive modelling is defined with reference to the traffic volume, traffic mix, flow speed and the road grade. Validation of the M4-M5 Link road traffic noise model is established by comparing the predicted noise levels against measured noise levels at 12 locations covering various traffic flow and road conditions. Actual traffic flow that coincided with the noise monitoring was used in the existing model. This resulted in close correlation between measured and predicted noise levels, and the variation found within industry accepted tolerances. In addition, the sound propagation algorithm was validated extensively by the United Kingdom's Department of Environment (Delany et. al. 1976) during the development of the Calculation of Road Traffic Noise (CoRTN). The CoRTN method is considered suitable for use under Australian conditions by the NSW EPA as outlined in the RNP.

Concern or query	Response
Operational noise impacts in the Rozelle interchange area due to a new set of traffic lights have not been considered. These issues are exaggerated by steeper grades	Road traffic noise in the vicinity of signalised intersections is characterised by interrupted flows that consist of periods of relatively low noise levels followed by periods of higher noise levels as vehicles accelerate away from the traffic lights to reach free flowing speed. There can also be periods where traffic travels at steady speed through the intersection. Road traffic noise source emission used in the predictive modelling is defined with reference to the traffic volume, traffic mix, flow speed and the road grade. The higher the speed, the higher the noise level. The adjustment for the extra noise from traffic on a gradient is also included. Operational noise modelling is conservative as the intersection is modelled assuming free flowing condition at posted speed (equal to or greater than 60 km/h). This is supported by the information shown in the figure below, where the A-weighted vehicle sound power level from 10 to 60 km/h for interrupted flow condition is evidently lower than free-flowing condition at or above 60 km/h (Sakamoto 2015).  Given that noise modelling is undertaken under free flow conditions at posted speeds which are greater than 60 km/h, the L_{Aeq} noise level over the assessment period would be consistent with steady state flows (Sakamoto 2015). As such, free flowing traffic is assumed to be representative for the purposes of noise modelling. Despite this, the assessment has also considered the impact of maximum noise events (refer to section 6.7 of Appendix J (Technical working paper: Noise and vibration) of the EIS). This assessment indicates that there would be only two areas where maximum operational noise levels are predicted to increase. These are located on the south side of Victoria Road at Iron Cove and the western side of Victoria Road at Rozelle. In both these cases the increases occur because of the demolition of buildings that currently shield the properties behind them from the traffic noise along Victoria Road. Many of the affected properties are likely to qualify for at-property treatments which would mitigate some of these noise events (see **section C10.13.2** for further information regarding at-property treatments).

Concern or query	Response
Noise impacts from ventilation facilities have not been considered, detailed or assessed	The operational noise and vibration assessment considered impacts from road traffic and fixed facilities including: ventilation facilities, tunnel jet fans, substations and water treatment plants. The study area for the assessment was developed according to the impacts likely to arise from project activities, including those related to construction, operation and cumulative scenarios where several of these plant items are operating in close proximity. This assessment is provided in section 6.12 of Appendix J (Technical working paper: Noise and vibration) of the EIS, with indicative sound power levels provided in Table 4-27. This indicates that there is only one location where an exceedance of the operational noise criteria would be incurred, at the Iron Cove Link, where there is an exceedance of 12 dBA. If not addressed through design (eg selection of low noise equipment, use of noise barriers etc), this may affect two residential properties, pending the implementation of feasible and reasonable at-property noise treatments. The cumulative noise emissions from all fixed facility noise sources would be considered during detailed design to determine the appropriate mitigation options to ensure compliance with relevant operation noise criteria, which may include noise barriers, silencers, acoustically lined ductwork and/or acoustic louvres.
The EIS contains no detail regarding the decibel level of noise emanating from the substation and ventilation facility on the corner of Callan Street and Victoria Road which is likely to exceed allowable levels for a residential area	Detail regarding the noise level associated with operational fixed facilities at the Iron Cove Link motorway operations complex (MOC4) is included in section 6.12 of Appendix J (Technical working paper: Noise and vibration) of the EIS, with noise contour maps provided in Annexure S of Appendix J (Technical working paper: Noise and vibration) of the EIS. The selected mechanical equipment for each operational facility, and in particular at Iron Cove Link, would be reviewed and assessed against the relevant operational noise criteria at the detailed design stage of the project. Specific plant would be selected and designed to achieve compliance with the relevant criteria. The cumulative noise emissions from all fixed facility noise sources would be considered when determining the appropriate mitigation options. This may include noise barriers, silencers, acoustically lined ductwork and/or acoustic louvres.
The cumulative noise assessment does not appear to include noise from aircraft operations which form a significant part of the ambient noise in many sites impacted by the WestConnex program of works	Noise monitoring results obtained for the EIS between July and November 2016 include the maximum sound pressure level (L_{Amax}), which is inclusive of aircraft flyovers, energy equivalent sound pressure (L_{Aeq}) which is representative of the ambient road traffic noise and the sound pressure level that was exceeded for 90 percent of the time (L_{A90}). The latter represents the background noise level when the noise environment is least affected by intermittent road traffic noise and maximum noise level events caused by aircraft flyovers. The background noise level is used to establish construction noise management levels and fixed facilities noise criteria. This approach is consistent with the ICNG and *Industrial Noise Policy* (INP) (NSW EPA 1999), and result in a more conservative assessment of construction noise and operational noise from fixed facilities. Noise from construction is described as the energy equivalent sound pressure level, denoted as $L_{Aeq(15minute)}$, and assessed in accordance with the ICNG. NSW EPA's assessment guideline does not require other extraneous noise sources to be assessed against the construction noise management levels. The RNP and INP were used to establish the operational noise criteria and to form the basis of the assessment process. NSW EPA's approach assesses noise from each distinct source (industrial and road traffic – with different noise characteristics) separately, and the assessment of aircraft noise is not required.

Concern or query	Response
The EIS documents provide octave band noise levels for various fans and substations but these are not sufficient to determine whether a tonal weighting applies and if one does, the noise assessment provided will have understated the noise impact by 5 dBA	The determination of any applicable modifying factors to account for characteristics that are considered to be particularly annoying, such as tonality and low frequency noise, will be confirmed during detailed design when mechanical plant is confirmed and selected for the project. Mitigation such as noise barriers, silencers, acoustically lined ductwork and/or acoustic louvres will be designed to achieve compliance with the INP criteria, inclusive of any applicable modifying factors.
The EIS does not identify or reference any combined operational noise modelling for Haberfield/Ashfield with both the M4 East portals and M4-M5 Link portals in operation	The operation of the M4-M5 Link tunnels at Haberfield and St Peters were assessed in the M4 East and New M5 EISs as part of the cumulative impact assessment for those projects. Further, both these interfacing WestConnex projects (the M4 East and New M5 projects), as well as other related road projects, are included in future forecast traffic scenarios, for which cumulative noise impacts are assessed (refer to section 26.4.3 of the EIS). Additionally, the conditions of approval for both of the interfacing WestConnex projects require the proponent of each project to undertake an Operational Noise and Vibration Review (ONVR) to confirm the operational noise predictions, impacts on receivers and the suitability of proposed mitigation measures. This review would be based on the final detailed design of each project and updated traffic modelling forecasts for the future traffic scenario as required by the RNP.
There is no assessment of the compound noise and vibration effect of multiple tunnels operating under the same property with dampening expected to be inadequate for receivers during operation	Operational ground-borne noise and vibration due to the movement of cars and trucks inside the tunnel would not be expected to be noticeable at the surface due to the vibration isolation provided by the rubber tyres and suspension systems of motor vehicles, as well as the distance and geology of the intervening rock. The geology of the project footprint is predominantly competent bedrock comprised of Hawkesbury Sandstone and Ashfield Shale, which would provide suitable attenuation of shallow tunnel noise. Additionally given the negligible levels of operational vibration, cumulative/additive vibration impacts from multiple tunnels operating is unlikely to occur.

Concern or query	Response
That the noise and vibration assessment has not accounted for soil and subsurface conditions that have a strong influence on the level of ground-borne vibration with the underlying soils within the project footprint being particularly vulnerable due to the abundance of stiff clay	Operational vibration due to the movement of cars and trucks inside the tunnel is considered to be negligible (as described above) and would not be expected to cause any noticeable impact at surface level properties. The effects of layered soils are negligible in the nearfield (ie close to the source) where the vibration levels are greatest. In the nearfield vibration attenuation is determined by geometric attenuation which has been accounted for in the modelling. The effects of reflections and/or absorption due to layered soils or other unknown subsurface conditions may be observable at great distances from the source where the vibration levels are small and not likely to result in vibration impacts.
Concern that the long term vibration impacts from the M4-M5 Link tunnels could impact the linear accelerators and national nuclear reactor that make isotopes for Australia has not been considered	The only known linear accelerators in the vicinity of the project are those at Royal Prince Alfred (RPA) Hospital at Camperdown. The proposed mainline tunnel would pass over 800 metres to the west of the location of these devices, and the tunnel would be between 30 and 50 metres below ground at this point. The National Medical Cyclotron that previously operated at RPA Hospital was decommissioned in 2009 and replaced by the ANSTO Research Cyclotron Facility. This facility is separated from the project by a similar distance to that of the linear accelerators at RPA Hospital and as such vibration impacts from operational traffic are unlikely.

C10.10 Traffic noise during operation

509 submitters raised concerns about operational traffic noise. Refer to section 10.4 of the EIS for details of potential noise and vibration impacts during operation and Chapter 6 of Appendix J (Technical working paper: Noise and vibration) of the EIS for the further detail on traffic noise during operation.

C10.10.1 Impacts from traffic noise

Submitters raised general concerns regarding increased noise from project operation. Specific concerns relate to the following:

- General increase in traffic noise during operation and its impact on residents
- Noise from increased traffic movements through local streets due to rat-running
- There would be increased noise levels at properties on Callan Street, Rozelle due to buses accelerating and decelerating at the proposed new bus stop on Victoria Road
- Removal of the trees (including on Euston Road and at the Darley Road site) would exacerbate the noise pollution that the project creates, as well as the transmission of noise from other existing roads such as City West Link, as trees act as noise suppressants
- There would be increased noise from City West Link traffic due to the removal of mature trees and buildings on the Darley Road site
- There would be increased noise from City West Link and surrounding streets from additional traffic, including at new signalised intersections where vehicles would stop and accelerate

- Impacts on local residents from traffic exiting the tunnels at the eastern end of City West Link to access Anzac Bridge
- Concern over the addition of a new set of traffic lights on City West Link which would result in significant additional operational noise from the stop-start traffic
- There would be an increase in noise arising from the proposed portal entrances/exits
- Congestion at exits from tunnels has the capacity to elevate noise impacts
- The operational traffic noise from the Rozelle interchange would affect many residents due to its location in a valley and would also affect nearby parks
- Concern about the underlying level of noise from the tunnels during operation and concerns about noise impacts from tunnels located underneath properties, calling for tunnels to be kept as deep as possible to minimise noise impacts
- There would be permanent operational noise as a result of tunnel traffic
- There would be a general increase in traffic noise from an increase in traffic volumes, including trucks
- General increase in traffic noise from trucks
- There would be increased noise in the area of Johnston Street due to increased traffic volumes
- Operational road traffic noise is clearly predicted to cause major noise problems for some residents
- Impacts and inconvenience caused by increased noise on Byrnes Street, Rozelle resulting from the increased traffic on Victoria Road
- Concern that access to Sydney Park would be difficult and unpleasant due to constant noise from increased traffic
- Installing a traffic signal near the tunnel portal north of the light rail stop at Rozelle would increase noise and emissions from vehicle stop-start and gear change, which would impact on residents on streets between Annandale Street and Railway Parade/Brenan Street.

Submitters expressed concern with the potential operational traffic noise impacts on the following receivers:

- Residents of Alexandria, Annandale, Lilyfield, Leichhardt and near Rozelle interchange, St Peters interchange and Rozelle interchange, including at The Crescent, Johnston Street, Catherine Street and Ross Street
- Residents, employees and businesses surrounding the Darley Road site
- Question as to why operational traffic noise will increase on Gordon Street
- Impact of operational traffic noise on Easton Park
- Impact of operational traffic noise on Sydney Park and residents in close proximity to Euston Road
- Increased traffic on Iron Cove Bridge will further increase the constant noise experienced by surrounding residents
- Increased noise from reflection of traffic noise on Victoria Road at Gladesville between apartment buildings on either side.

Response

Table C10-6 Response to traffic noise concerns

Concern or query	Response
General increase in traffic noise during operation and its impact on residents	Operational traffic noise has been assessed as part of the EIS and supporting technical studies. Appendix J (Technical working paper: Noise and vibration) of the EIS indicates that receivers near to the project are already subject to existing road traffic noise impacts and in many cases already exceed the *Noise Criteria Guideline* (NCG) (Roads and Maritime 2015a) controlling criterion. During operation, the following noise and vibration changes are expected: • A general reduction in the number of receivers exceeding the NCG criteria across the study area as a result of forecast reductions in traffic volumes on some parts of the road network as a result of the project (ie moving vehicles from surface roads to the tunnels) • A reduction in noise levels for around 60 per cent of the receivers within the study area • A minor (less than 2 dBA) increase in noise levels for around 40 per cent of receivers in the study area (considered unlikely to be perceptible by the average person) • A noise increase of more than 2 dBA for less than one per cent of receivers in the study area • Significant reductions in noise (up to around 4 dBA) along sections of Victoria Road at Rozelle, where the project is forecast to significantly reduce traffic volumes • Large increases in noise (up to around +15 dBA) have been identified on the southern side of Victoria Road near Iron Cove in the vicinity of the proposed Iron Cove Link tunnel portals and near the new Victoria Road bridge, where the project results in traffic lanes being moved closer to receivers, in combination with removing existing screening due to property acquisitions. These predicted increases are generally limited to the receivers which have partial or direct line of sight to Victoria Road once the acquired buildings are demolished. Locations subject to exceedances of noise criteria as a result of the project or cumulatively would be assessed further during development of the detailed design to identify feasible and reasonable noise mitigation measures that may be applied Additional noise control measures that would be considered include a combination of low noise pavements, the use of noise barriers and application of at-property treatments.
Noise from increase traffic movements through local streets due to rat running	All major traffic carrying roads which are within the project operational boundary have been included in the assessment. This ensures that redirected traffic as a result of operation of the project is captured in the noise assessment. Overall the project is expected to generally ease traffic congestion throughout much of the surrounding surface network, including main arterial routes such as Parramatta Road. It would also offer rapid, direct connections to strategic elements of Sydney's broader motorway network. As such the need for rat running on local roads (and the associated noise impacts) is not expected to increase.

Concern or query	Response
There would be increased noise levels at properties on Callan Street, Rozelle due to buses accelerating and decelerating at the proposed new bus stop on Victoria Road	Increases in operational noise of up to around +15 dBA are identified at Victoria Road near Iron Cove Bridge in the vicinity of the proposed tunnel portals, and near the new Victoria Road bridge at Rozelle. This is due to traffic lanes being moved closer to receivers, in combination with the removal of the screening offered by existing buildings that are proposed to be demolished. In order to mitigate operational noise impacts in the Iron Cove area, the use of low noise pavements, noise barriers or architectural treatments would be investigated further during detailed design. Should these prove reasonable and feasible, these measures would act to mitigate some or all of the operational noise increases associated with the project at this location, including the noise from bus movements.
Removal of the trees (including on Euston Road and at the Darley Road site) would exacerbate the noise pollution that the project creates during operation, as well as the transmission of noise from other existing roads such as City West Link, as trees act as noise suppressants	The removal of trees and vegetation during site establishment is not expected to change the existing noise levels at nearby sensitive receivers during project operation as vegetation generally does not perform well as a noise attenuator, though it is recognised that the attenuation perceived to be provided is important in many locations. Operational noise impacts at Euston Road were identified in the New M5 EIS and noise and vibration assessment and will be managed through an Operational Noise and Vibration Review undertaken for the New M5 project.
There would be increased noise from City West Link and surrounding streets from additional traffic, including at new signalised intersections where vehicles would stop and accelerate	The assessment of operational road traffic noise without mitigation indicates that the project would not result in any exceedances greater than 2 dBA along City West Link or any other nearby streets such as Johnston Street at Annandale. This is a marginal and therefore acceptable change in accordance with the requirements of the RNP and NCG.
There would be an increase in noise arising from the proposed portal entrances/exits	As outlined in section 6.2.1 of Appendix J (Technical working paper: Noise and vibration) of the EIS, there is not predicted to be any exceedances of the operational noise criteria around the tunnel portals at Rozelle. Exceedances expected at Iron Cove are due to the project moving existing surface traffic lanes on Victoria Road closer to receivers, in combination with removing existing screening due to property acquisitions. Exceedances at this location would not be caused by noise from tunnel portals, which is shown to be generally localised (refer to Annexure S of Appendix J (Technical working paper: Noise and vibration) of the EIS).
Congestion on exits from tunnels has the capacity to elevate noise impacts	During congestion, vehicle speeds generally decrease significantly. As the vast majority of operational road traffic noise is generated by rolling tyres on the road surfaces (as opposed to noise from operating engines), the associated noise impacts would be generally expected to decrease during such events. It is acknowledged that some vehicles such as trucks and some motorcycles may have noisy engines at idle or slow speed which may elevate noise levels compared to idling cars. These vehicles however make up a small percentage of traffic and such congestion events are likely to be rare, resulting in minor, temporary impacts upon nearby receivers.

Concern or query	Response
The operational traffic noise from the Rozelle interchange would affect many residents due to its location in a valley and would also affect nearby parks	As outlined in section 6.2.1 of Appendix J (Technical working paper: Noise and vibration) of the EIS, there is not predicted to be any operational traffic noise exceedances of the operational noise criteria threshold for receivers around the tunnel portals at Rozelle (ie those on the southern side of the Rozelle Rail Yards). This assessment has been undertaken using a three dimensional model of the area, including the topography of the valley. The impact of operational traffic noise has been assessed to both active and passive open space uses as per the requirements of the NCG. Exceedances of the criteria are discussed in Appendix J (Technical working paper: Noise and vibration) of the EIS, with mitigation measures outlined for all exceeding receivers.
Concern about the underlying level of noise from the tunnels during operation and concerns about noise impacts from tunnels located underneath properties. Request for tunnels to be kept as deep as possible to minimise noise impacts	Ground-borne noise and vibration from traffic movements inside the operational tunnel is considered to be negligible and would not be noticeable at surface level properties. This is because rubber tyres and suspension systems of motor vehicles provide vibration isolation, therefore it is unusual for motor vehicles to cause ground-borne noise or vibration problems. On the surface, when heavy vehicles result in rattling of windows, for example, the source is almost always airborne noise.
There would be a general increase in traffic noise from an increase in traffic volumes, including trucks	As outlined above, the project is predicted to decrease congestion and lower the overall traffic volumes on the majority of surface roads in the network, particularly major arterial routes such as Parramatta Road. This would include heavy vehicles, which are predicted to preferentially utilise the proposed tunnels over the existing surface roads. The overall reduction in traffic on surface roads would result in a reduction of road traffic noise, with less than one percent of receivers in the noise study area predicted to experience exceedances of more than 2 dBA.
There would be increased noise in the area of Johnston Street due to increased traffic volumes	Appendix J (Technical working paper: Noise and vibration) of the EIS indicates that traffic noise on Johnston Street is predicted to increase by less than 2 dBA as a result of the redistribution of traffic. This is a marginal and therefore acceptable change in accordance with the requirements of the RNP and NCG. Further modelling and assessment will be undertaken during the detailed design phase to confirm noise impact. If identified as needing noise mitigation, suitable measures will be evaluated and implemented where feasible and reasonable.
Operational road traffic noise is clearly predicted to cause major noise problems for some residents	The assessment has been carried out in accordance with the relevant policy (RNP) and includes a 600 metre boundary width either side of the main project road alignment in accordance with this policy. The project would seek to reduce or eliminate these exceedances wherever possible during the detailed design phase through the implementation of various measures such as low noise pavements, noise barriers or at-property treatment.
Impacts and inconvenience caused by increased noise on Byrnes Street, Rozelle resulting from the increased traffic on Victoria Road	Three properties in Byrnes Street at Rozelle are predicted to experience an increase in noise as a result of the project operation, after accounting for buildings that would be removed as part of the project. These properties would be considered for additional noise mitigation during detailed design, including the use of low noise pavements, noise barriers or at-property treatments. See environmental management measures NV10 and NV11 in **Chapter E1** (Environmental management measures) for further information.

Concern or query	Response
Concern that access to Sydney Park would be difficult and unpleasant due to constant noise from increased traffic	The noise and vibration generated by the operational project is unlikely to affect the ability to access Sydney Park, or other public open spaces in the vicinity of the project and other affected surface roads. The impact upon the amenity of these areas from operational noise associated with the project has been assessed in Chapter 14 (Social and economic) of the EIS. This assessment outlined that around 99 per cent of receivers across the study area are predicted to experience a reduction in operational traffic noise or an increase of less than 2 dBA. The only public open space area identified with an exceedance of the relevant criteria was along Bayview Crescent at Annandale. Additional noise mitigation measures for this location would be investigated during and upon completion of the detailed design and the preparation of revised noise modelling.
Installing a traffic signal near the tunnel portal north of the light rail stop at Rozelle would increase noise and emissions from vehicle stop/start/gear change, which would impact on residents on streets between Annandale Street and Railway Parade/Brenan Street	The operational traffic noise associated with the new location of the intersection between The Crescent and City West Link has been modelled as part of the EIS. This modelling has taken into account the reduced separation between traffic and residential properties. The predictions of the model indicate that five properties on or near the corner of Bayview Crescent and Railway Parade would be subject to minor increases in operational noise during the daytime and night time. These increases would be between 0.5 dBA and 1.5 dBA and are unlikely to be noticeable to residents above existing background levels. As such these increases would not trigger consideration of additional noise mitigation.
Impact of operational traffic noise on residents of Alexandria and near Rozelle interchange, St Peters interchange, including at The Crescent, Johnson Street and Catherine Street	Alexandria – operational noise in this location is predicted to increase by less than 2 dBA. This is a marginal and therefore acceptable change in accordance with the requirements of the RNP and NCG. Rozelle – operational noise around the proposed interchange location would be less than 2 dBA for all receivers with the exception of properties near the intersections of Lilyfield Road, Hornsey Street and Quirk Street with Victoria Road, which would experience increase in operational noise due to the demolition of existing buildings that provide noise screening. It is highly likely that these properties would qualify for consideration of feasible and reasonable additional noise mitigation measures such as quieter road surface, noise barriers or at-property treatments. St Peters – the construction and operation of the St Peters interchange has been assessed within the New M5 EIS and is not included in this project. The Crescent and Johnston Street, Annandale – operational road traffic noise along The Crescent would result in minor noise increases to properties on Bayview Crescent and Railway Parade. These increases would be less than 2 dBA and as such would not be noticeable above existing background levels under most circumstances. Catherine Street, Lilyfield – operational road traffic noise along this street is not predicted to increase by more than 2 dBA and as such would not be noticeable above existing background levels under most circumstances. Further modelling and assessment will be undertaken during the detailed design phase to confirm the predicted noise impacts outlined above. If exceedances are identified suitable measures would be evaluated and implemented where feasible and reasonable.

Concern or query	Response
Impact of operational traffic noise on residents, employees and businesses surrounding the Darley Road site	The noise impacts on residents from the Darley Road water treatment plant has been assessed and shown not to exceed noise management levels at any time of the day or night during operation. At this stage the use of the residual land during operation has not been confirmed and as such operational fixed facility noise impacts upon businesses have not been assessed. Operational traffic at this site was assessed and found not to exceed the NCG controlling criteria of increase in noise greater than 2 dBA. This is a marginal and therefore acceptable change in accordance with the requirements of the RNP and NCG. Further modelling and assessment will be undertaken during the detailed design phase to confirm noise impact. If identified as needing noise mitigation, suitable measures will be evaluated and implemented where feasible and reasonable.
Question as to why operational traffic noise will increase on Gordon Street	Operational noise is predicted to increase on Gordon Street at Rozelle as a result of localised changes to traffic flows. This increase would however be less than 2 dBA. This is a marginal and therefore acceptable change in accordance with the requirements of the RNP and NCG. Further modelling and assessment will be undertaken during the detailed design phase to confirm noise impact. If identified as needing noise mitigation, suitable measures will be evaluated and implemented where feasible and reasonable.
Impact of operational traffic noise on Easton Park	Operational noise at Easton Park is predicted to increase by less than 2 dBA. This is a marginal and therefore acceptable change in accordance with the requirements of the RNP and NCG. Further modelling and assessment will be undertaken during the detailed design phase to confirm noise impact. If identified as needing noise mitigation, suitable measures will be evaluated and implemented where feasible and reasonable.
Impact of operational traffic noise on Sydney Park and residents in close proximity to Euston Road	The construction and operation of the St Peters interchange has been assessed in the New M5 EIS and is not included in this project.
Increased traffic on Iron Cove Bridge will further increase the constant noise experienced by surrounding residents	Large increases in noise (up to around +15 dBA) have been identified on the southern side of Victoria Road near Iron Cove in the vicinity of the proposed Iron Cove Link tunnel portals, where the project results in traffic lanes being moved closer to receivers, in combination with the demolition of properties currently providing noise screening to the second and subsequent rows of buildings. These predicted increases are generally limited to the receivers which have partial or direct line of sight to Victoria Road once the acquired buildings are demolished. Around 33 properties would be subject to such noise increases in this location, the majority of which would be less than 5 dBA. If the project is approved, the detailed design for the project would be reassessed for operational road traffic noise impacts. Where noise exceedances are predicted these receivers would qualify for the consideration of additional feasible and reasonable noise mitigation measures. This may include low noise pavements, noise barriers or at-property treatments.

Concern or query	Response
Increased noise from reflection of traffic noise on Victoria Road at Gladesville between apartment buildings on either side	Operational road traffic noise at Gladesville is outside the study area of the assessment.

C10.11 Vibration impacts during operation

28 submitters raised concerns about impacts of vibration during operation of the project. Refer to section 10.4 of the EIS for details of potential noise and vibration impacts during operation.

C10.11.1 Operational vibration impacts

Concerns were raised that the project would result in operational vibration impacts on dwellings located above or near to the alignment of the tunnel(s). Specific concerns relate to the following:

- Concern about vibration if the tunnel depth is approved for 24 metres instead of the recommended 30 to 35 metre depth. Request the tunnels be kept as deep as possible to reduce vibration impacts
- Future traffic usage of the tunnels will cause vibrations and likely cause damage to dwellings with residents calling for guarantees this will not be the case and for adequate compensation if it does
- Increased operational vibration impacts at homes that are primarily founded in stiff clay.

Response

Vehicles using the project tunnels during operation would not generate vibration that would be able to be transmitted through the tunnel and overlying rock/soils at levels which would be detectable at the surface. This is because:

- Vehicles would generate relatively low intensity vibration
- The tunnel road pavement would not have expansion joints and would therefore not generate the noise and vibration effects from jointed concrete pavements
- The vehicle vibration sources would not be in direct contact with the transmitting rock above the tunnel, with significant vibration attenuation provided by the tunnel structure and the air column within the tunnel
- The tunnel would be located at significant depth in most locations. The intervening rock in these deep locations would attenuate any vibration affects from operational traffic. The project team is not aware of vibration issues arising from any other existing road tunnels in Sydney.

The effects of layered soils are negligible in the nearfield (ie close to the source) where the vibration levels are greatest. In the nearfield, vibration attenuation is determined by geometric attenuation which has been accounted for in the modelling. The effects of reflections and/or absorption due to layered soils or other unknown subsurface conditions may be observable at great distances from the source where the vibration levels are small and not likely to result in vibration impacts.

C10.12 Operation noise from fixed facilities

90 submitters raised concerns about impacts during operation from fixed facilities. Refer to section 10.4 of the EIS for details of fixed facilities operational noise impacts and section 6.12 of Appendix J (Technical working paper: Noise and vibration) of the EIS for the further detail on the noise and vibration assessment.

C10.12.1 Noise impacts from the operation of ventilation systems, treatment plants and other fixed facilities

Submitters raised general concerns with the potential impacts from continuous noise from the ventilation systems and from other infrastructure. Specific concerns raised were:

- The Iron Cove Link ventilation facility, including:
  - The 12 dBA increase at residents of Springside Street and Callan Street at Rozelle from the air supply plant and electrical substation. This may exceed the allowable noise levels for a residential area with little detail of impacts being provided in the EIS
  - The noise generated from the ventilation outlet due to the velocity of the air being expelled from this facility
  - General noise impacts on surrounding homes and businesses
- The EIS has no details on the noise impacts for the substation and water treatment plant (Leichhardt), therefore the public cannot comment on the permanent facility effects on the area.

Response

The applicable operational noise criteria for the fixed facility elements of the project have been developed in accordance with the *Industrial Noise Policy* (NSW EPA 2000). The prediction of industrial noise from fixed facilities associated with the operation of the project was undertaken using three-dimensional models of the existing ground conditions and proposed project design.

The major sources of noise from fixed facilities are in-tunnel jet fans (near the tunnel portals), ventilation facilities, substations and water treatment plants. Noise impacts from the operation of the fixed facilities associated with the project have been predicted for the NCAs nearest to the facilities. These predicted noise levels are summarised in **Table C10-7** and are also shown on the noise contour maps provided in Annexure S of Appendix J (Technical working paper: Noise and vibration) of the EIS. The noise assessment undertaken assumes that there would be minimal mitigation of fixed facility noise sources by common engineering methods. In practice it is likely that these methods, including the selection of lower noise equipment and the use of acoustic shielding, would be adopted as part of the detailed design to reduce or eliminate nearby noise exceedances from this equipment.

Table C10-7 Predicted noise levels – fixed facilities

Area	NCAs	Noise level (dBA L_{Aeq})		
		Criteria	Predicted	Exceedance
Haberfield	NCA01	43	33	-
	NCA02	45	36	-
	NCA03	45	35	-
	NCA06	45	39	-
Darley Road	NCA09	45	41	-
	NCA13	45	45	-
Rozelle	NCA15	40	28	-
	NCA16	45	35	-
	NCA19	45	39	-
	NCA20	40	34	-
	NCA21	45	39	-

Area	NCAs	Noise level (dBA L_{Aeq})		
		Criteria	Predicted	Exceedance
	NCA24	45	34	-
	NCA25	45	33	-
	NCA27	45	24	-
Iron Cove	NCA33	45	57	12
	NCA34	45	40	-
	NCA35	45	42	-
	NCA36	45	39	-
St Peters	NCA46	45	20	-
	NCA48	45	30	-
	NCA49	45	41	-
	NCA50	45	34	-
	NCA51	44	28	-

The results in **Table C10-7** assume the presence of existing noise barriers along the south side of City West Link at Rozelle and along the north side of Victoria Road at Iron Cove, and include noise barriers currently being constructed along the south side of Wattle Street at Haberfield as part of the M4 East project. The results do not account for the potential installation of new noise barriers that may be proposed as an additional mitigation measure or in response to conditions of approval for the M4-M5 Link project, which may act to reduce the exceedances shown.

The results indicate that the assessed fixed facilities are predicted to comply with the relevant criteria during the more stringent night-time period in all NCAs at the Haberfield, Darley Road, Rozelle and St Peters areas.

Noise emissions from fixed facilities at the Iron Cove area are predicted to exceed the criterion by up to 12 dBA at the most affected receivers in NCA33, adjacent to the substation. This assumes the substation noise source is at the closest point to the nearest residence, with no shielding from a substation building or intervening walls. This includes modelling of the noise of air expelled from the ventilation outlet near this NCA.

The EIS outlines that the selected mechanical equipment for each facility, and in particular at the Iron Cove Link motorway operations complex (MOC4), would be reviewed and assessed against the relevant noise criteria at the detailed design stage of the project. Specific plant would be selected and designed to achieve compliance with the relevant criteria. As such it is likely that a reduction or elimination of this exceedance would occur at that stage. In general the project would seek to comply with the INP for all operational fixed facilities.

No noise exceedances from in-tunnel jet fans, ventilation facilities or water treatment facilities are predicted. This includes consideration of the noise generated by air being expelled from ventilation outlets.

During operation of the project, the Darley Road motorway operations complex (MOC1) would include a permanent water treatment plant. As shown in **Table C10-7**, there would be no noise exceedances from equipment at this location.

Modifying factors

The indicative source levels have not been found to trigger the requirement to correct the predicted noise level due to low frequency and/or tonal components. Notwithstanding, tonal and/or low frequency noise is often observed from fans and the predictions would be revisited during detailed design based on the actual specifications of the final selection of equipment. Based on the assessment presented in this report, receivers in NCA09 (northern side of City West Link, west of Darley Road intersection), NCA13 (southern side of Darley Road), NCA34 (north of the Iron Cove Link portals), NCA35 (north of the Iron Cove Link portals, adjacent to Iron Cove) and NCA49 (either side of the southern extent of Barwon Park Road) have been identified as having the potential to exceed the relevant noise criteria in this manner.

Mitigation

It is noted that the equipment and sound power levels modelled are indicative only and may be subject to change during the detailed design phase of the project. It is envisaged that the mechanical plant noise sources associated with the fixed facilities would be controllable by common engineering methods that may consist of:

- Judicious location selection (including shielding by other project buildings and equipment)
- Judicious selection of equipment with lower noise outputs
- Noise barriers/hoods/insulation
- Silencers
- Acoustically lined ductwork
- Acoustic louvres.

The selected mechanical equipment would be reviewed and assessed for conformance with the established criteria at the detailed design stage of the project when specific plant selection is finalised and appropriate noise control measures can be determined. The cumulative noise emissions from all fixed facility noise sources would be considered when determining the appropriate mitigation options.

C10.13 Operational noise and vibration environmental management measures

408 submitters raised concerns about the operational noise and vibration environmental management measures. Refer to **Chapter E1** (Environmental management measures) for details on the noise and vibration environmental management measures.

C10.13.1 Noise mitigation measures (general)

Submitters queried the type of noise mitigation available and request assurances that mitigation would be in place. Specific concerns include:

- Concern that the demolition of buildings along Lilyfield Road (which block noise generated by nearby roads) would not be mitigated by having adequate operational noise mitigation measures
- Residents want assurance that they would receive appropriate and adequate management measures
- The noise mitigation measures proposed for the Leichhardt area are inadequate
- Concern that due to the indicative nature of the design, the ‘preferred noise mitigation options’ have not been finalised leaving residents with no idea as to what is planned
- The approach to mitigation for noise from the project is not consistent with the precautionary principle as residents must accept noise pollution generated
- The proponent should be required to extend the number of properties compulsorily acquired to all residences subject to noise that exceeds the guidelines
- That noise surveys to monitor noise levels are stated as a means for reducing noise when there would need to be continuous direction noise monitoring systems in place to do this
- Concern that proposed noise walls up to eight metres high would be rejected by some residents for aesthetic reasons and loss of environmental aspect
- If the imposition on noise affected residents cannot be controlled a financial offer of compensation must be offered
- No noise barriers have been proposed and should be included in the EIS for consideration
- Sound preventing footpaths should be utilised
- The EIS provides no justification for not treating residential buildings exposed to road traffic noise greater than two storeys in height

- Target noise levels at residences on Lilyfield Road shall be a reduction on current measured levels
- Mitigation measures for City West Link need to be identified.

Response

Table C10-8 Response to mitigation measures - general

Concern or query	Response
Concern that the demolition of buildings along Lilyfield Road (which block noise generated by nearby roads) would not be mitigated by having adequate operational noise mitigation measures	As outlined in Annexure L of Appendix J (Technical working paper: Noise and vibration) of the EIS, properties along Lilyfield Road near the Victoria Road intersection would be exposed to increased noise due to the removal of the shielding effect of commercial buildings that are proposed to be demolished. The removal of other buildings along the southern side of Lilyfield Road and any screening effect they currently provide is also accounted for in this prediction. These predicted increases are generally limited to the receivers which would have partial or direct line of sight to Victoria Road once the acquired buildings are demolished. This location would be assessed further during development of the detailed design to identify appropriate noise mitigation measures to address these predicted increases. The project design will consider the location of the carriageways and additional measures that would be considered would include low noise pavement, noise barriers and at-property treatments.
Residents want assurance that they would receive appropriate and adequate management measures	The project would seek to reduce and/or eliminate operational noise impacts wherever feasible and reasonable as part of the detailed design phase. This would include design modification, the use of noise controls such as low-noise pavement, noise barriers and/or at-property treatments. For fixed facilities the project would apply judicious selection of operational equipment with a view to minimising noise exceedances. Residential properties would be considered for such measures where exceedances are predicted by noise modelling prepared on the basis of the detailed design. This would include assessment of project fixed facilities as well as operational road traffic noise. Environmental mitigation measures are outlined in **Chapter E1** (Environmental management measures). This includes a range of commitments to manage noise arising from the project with view to minimising impacts upon sensitive receivers. Environmental management measure NV14 includes a commitment to undertake measurement of the actual operational noise performance of the project and compare this to the predicted operational noise performance within 12 months of the commencement of the operation of the project. The assessment will include identification of any further feasible and reasonable noise mitigation measures required to meet the relevant operational road traffic noise criteria, and identify timing and responsibilities for implementation.
The noise mitigation measures proposed for the Leichhardt area are inadequate	The process for selecting the appropriate mitigation measures to address noise in the operation phase of the project are consistent with Roads and Maritime's NCG, *Noise Mitigation Guideline and Environmental Noise Management Manual*, as well as the RNP and INP. As outlined above, the proposed mitigation measures would be further investigated according to the results of noise modelling undertaken on the basis of the detailed design.

Concern or query	Response
Concern that due to the indicative nature of the design, the 'preferred noise mitigation options' have not been finalised leaving residents with no idea as to what is planned	The project is currently at concept design stage. Operational noise predictions have been made on the basis of the design as it currently stands, though it is acknowledged that this could differ from the final detailed design. As such the noise mitigation measures proposed are subject to revision once noise predictions are revisited as part of the detailed design stage. The project would apply mitigation measures to manage operational noise impacts and comply with relevant operational noise requirements.
The approach to mitigation for noise from the project is not consistent with the precautionary principle as residents must accept noise pollution generated	The Environmental Planning and Assessment Regulation 2000 (NSW) define the precautionary principle to be 'that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'. The regulations also state that 'In the application of the precautionary principle, public and private decisions should be guided by: (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and (ii) an assessment of the risk-weighted consequences of various options'. With regard to operational noise, the project has undertaken detailed modelling of noise and vibration impacts which has provided a reasonable indication of the likely impacts. The approach to mitigation measures currently proposed to manage these impacts have been frequently used on other road projects in Sydney and more broadly and have been demonstrated to be effective. As such there is reasonable scientific certainty about the likely noise impacts and the effectiveness of mitigation measures proposed. Measures to mitigate or avoid impacts are not being postponed due to any residual uncertainty. Rather, the specific nature of mitigation measures would be confirmed once the specific noise impacts of the detailed design are known. At this stage the project would seek to reduce or eliminate operational noise impacts wherever feasible or reasonable such that these mitigations would be in place prior to the project becoming operational. This process would inherently include careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and assessment of the risk-weighted consequences of various options. The assessment and the proposed approach to select appropriate mitigation, therefore, satisfy the precautionary principle.

Concern or query	Response
The proponent should be required to extend the number of properties compulsorily acquired to all residences subject to noise that exceeds the guidelines	Less than one per cent of receivers are predicted to experience exceedances of the relevant operational road traffic noise criteria greater than the 2 dBA threshold. In addition to this, the project would seek to apply further operational noise mitigation measures to reduce or eliminate residual exceedances at the detailed design stage, as per the requirements of the project SEARs and relevant policy/guideline documents. Extending compulsory acquisition to all properties exceeding the threshold (potentially hundreds of receivers within the study area), would be impractical, extremely expensive and is not consistent with Roads and Maritime policy with regard to increases in traffic noise along already busy road corridors. The project has however committed to assessing any predicted noise increases in further detail upon preparation of a detailed design, with those properties found to be exceeding thresholds to be further considered for additional mitigation measures, such as the use of noise barriers or at-property treatments. It is expected that this would substantially reduce the final operational noise impacts of the project where these exceedances are predicted to occur.
Noise surveys to monitor noise levels are stated as a means for reducing noise when there would need to be continuous direction noise monitoring systems in place to do this	It is expected that operational noise monitoring would be imposed as a condition of approval for the project, similar to the M4 East and the New M5 projects. This would seek to compare actual noise levels against those predicted at the detailed design stage. If necessary, additional management measures would be recommended to address any operational performance issues identified. This monitoring would not need to be continual but would need to be in place for a long enough period to capture representative noise levels arising from the project. The specific locations and durations for this monitoring would be determined should this be a condition of approval for the project.
Concern that proposed noise walls up to eight metres high would be rejected by some residents for aesthetic reasons and loss of environmental aspect	The use of noise barriers has been assessed in section 6.5 and Annexure O of Appendix J (Technical working paper: Noise and vibration) of the EIS. This assessment outlines the recommended height of the barriers in certain locations where operational noise impacts have been predicted. This section of the assessment comments on the reasonableness and feasibility of the barriers in these locations, including comment upon the likely acceptability from an urban design perspective. In virtually all cases the assessment concludes that new noise barriers up to eight metres in height would be either technically unsuitable or would not be acceptable from an urban design, active transport connectivity and/or community cohesion perspective, and suggests that other noise management measures should be explored. This includes consideration of the potential for amenity and aesthetic impacts upon nearby residents.
If the imposition on noise affected residents cannot be controlled a financial offer of compensation must be offered	Roads and Maritime's *Noise Mitigation Guideline* outlines the approach Roads and Maritime takes to the evaluation, selection and design of feasible and reasonable operational noise mitigation measures. This includes low noise pavement, noise barriers and at-property treatments. The guideline specifically rules out the offer of financial compensation in lieu of undertaking at-property treatments.

Concern or query	Response
No noise barriers have been proposed and should be included in the EIS for consideration	The location and effectiveness of existing and potential noise barriers have been fully considered and assessed within section 6.5 and Annexure O of Appendix J (Technical working paper: Noise and vibration) of the EIS. The option of noise walls would also be considered when potential operational road traffic noise impacts are reassessed during the development of the detailed design.
Sound preventing footpaths should be utilised	The range of noise control measures that can be implemented on Roads and Maritime projects where reasonable and feasible is outlined in the Roads and Maritime *Environmental Noise Management Manual* and *Noise Mitigation Guideline.*
The EIS provides no justification for not treating residential buildings exposed to road traffic noise greater than two storeys in height	The noise and vibration assessment in Appendix J (Technical working paper: Noise and vibration) of the EIS does not suggest that at-property property treatment should be limited according to which floor the property is on. Table 6-3 in Appendix J (Technical working paper: Noise and vibration) of the EIS identifies 157 receivers on the third floor or above as being triggered for consideration of feasible and reasonable noise mitigation measures.
Target noise levels at residences on Lilyfield Road should be a reduction on current measured levels	Operational noise criteria throughout the project have been set according to NCG. The NCG sets out four key principles aimed to guide the assessment. These are: • Criteria are based on the road development type that a receiver would be affected by due to the road project • Adjacent and nearby residences should not have significantly different criteria for the same road • Criteria for the surrounding road network are assessed where a road project generates an increase in traffic noise greater than 2 dBA on the surrounding road network • Protect existing quiet areas from excessive changes in amenity due to traffic noise. These principles have been applied across the study area of the EIS, including Lilyfield Road. It is noted that there would be an increase in exceedances of this criteria in this location prior to the application of mitigation measures. During and post-completion of the project's detailed design additional feasible and reasonable mitigation measures would be considered for this location, including low noise pavements, the use of noise barriers and at-property treatments. The application of one or more of these measures would be expected to reduce the number of properties in this location that would be subject to exceedances of the criteria.

C10.13.2 At-property acoustic treatment – types, eligibility and requests

Submitters requested acoustic treatments (such as double glazing) at their properties and raised other queries regarding at-property acoustic treatment, including:

- Request that affected residents on Toelle, Springside and Callan Streets, Rozelle are offered acoustic insulation to mitigate increased traffic noise from the tunnel exit at Iron Cove and operational noise from the ventilation facility
- Request for noise mitigation measures to be implemented at schools including Haberfield Public School
- Request that classrooms at Rozelle Public School are maintained to ANSI Standards (ANSI S12.60-2002, *Acoustical Performance Criteria, Design Requirements and Guidelines for Schools*) to minimise disturbance to student learning

- Claims that timber dwellings cannot be acoustically treated to reduce noise pollution are false. The required treatment would involve a full rebuilding and this cost should be borne by the project.

Response

At-property acoustic treatment would be considered at each of the properties which require further consideration of feasible and reasonable noise mitigation (refer to section 6.2.2 and Annexure M of Appendix J (Technical working paper: Noise and vibration) of the EIS for a list of these properties). The number of receiver locations which require further consideration of noise mitigation would be confirmed during detailed design. At this stage it is likely that properties at the northern ends of Toelle, Callan and Springside Streets at Rozelle, in addition to other properties identified, would qualify for further consideration of noise mitigation, although this would be confirmed upon further assessment of the detailed design.

Where a receiver is confirmed during detailed design as being eligible for consideration of at-property acoustic treatment, further consultation with the affected landowner will be carried out.

At-property traffic noise mitigation measures may replace or supplement at-road mitigation, only in the following circumstances, subject to a reasonable and feasible assessment:

- Isolated single residences or isolated groups of closely spaced residences as defined in the *Noise Mitigation Guideline*
- Where the affected community expresses a preference for at-property treatment and the cost is less than a combination of a barrier and at-property treatment
- Where noise barriers or low noise pavements alone do not achieve the level of noise mitigation (insertion loss) required
- Where the only applicable noise criteria are internal (eg places of worship, hospitals or schools and childcare centres where play areas meet external criteria)
- Where other noise mitigation measures have been shown not to be feasible or reasonable.

These treatments are generally limited to acoustic treatment of the building elements (doors, windows, vents, etc.) or courtyard fences where they reduce noise to habitable rooms. The installation of courtyard fences close to the dwelling may also provide some mitigation for outdoor living spaces.

The overall goal of the architectural treatment is to provide similar acoustic amenity and internal noise levels to those experienced within a receiver where the external noise criteria have been met.

In most instances, assuming brick construction and standard glazing, this goal equates to internal noise levels that are around 20 dBA less than the external noise criteria with windows closed. In practice there will be some variation in reduction due to the design of the existing building and other limitations such as building condition. A 20 dBA goal results in internal noise levels that are consistent with other guidelines. These guidelines include the *State Environmental Planning Policy (Infrastructure) 2007* (NSW) and Australian Standard 2107. The 20 dBA goal also provides protection against a large increase in internal noise level in accordance with the NCG and RNP relative increase criterion.

Building element treatments are more effective when they are applied to masonry structures than lightly clad timber frame structures. The architectural treatments provided by Roads and Maritime typically include:

- Fresh air ventilation systems that meet the *National Construction Code of Australia* requirements with the windows and doors closed
- Upgraded windows and glazing and solid core doors on the exposed facades of the substantial structures only (eg masonry or insulated weather board cladding with sealed underfloor). These techniques would be unlikely to produce any noticeable benefit for light frame structures with no acoustic insulation in the walls
- Upgrading window or door seals and appropriately treating sub-floor ventilation
- The sealing of wall vents
- The sealing of the underfloor below the bearers
- The sealing of eaves.

Alternative at-property treatments include the installation of courtyard fences that break the line of sight between the affected facade window and the road, where they are feasible and reasonable and are preferred by the landowner.

Inspections would be completed before treatment packages are agreed and installed. Treatment packages would only be recommended and considered feasible and reasonable where they are predicted to provide a noticeable improvement in noise reduction (3 dBA or greater) compared to the existing scenario. In some instances partial treatment packages may be considered feasible and reasonable where the existing system forms part of the recommended package.

During the installation phase of the acoustic treatments, ownership details would be obtained for all receivers identified as eligible for consideration of at-property treatment. This phase would also identify the location of internal habitable areas for each dwelling.

The implementation of reasonable and feasible at-property acoustic treatment would be in accordance with Roads and Maritime's *At-property Noise Treatment Guideline* (Roads and Maritime 2017). This does not extend to fully rebuilding a dwelling for noise mitigation reasons.

C10.13.3 Control measures for increased traffic noise

Submitters requested sound attenuation measures to control the increased traffic noise during operation. Specific requests and concerns include:

- Request for a sound barrier at the Darley Road civil and tunnel site
- Request for a noise screen/wall on the north side of City West Link to minimise noise in the Rozelle/Lilyfield area
- Request for a substantial noise wall at the end of Byrnes Street, Rozelle to mitigate noise impacts from Victoria Road and improve the amenity of King George Park
- The mature tree at the Darley Road site provides a noise barrier from City West Link and should not be removed
- More trees need to be planted, compared to what has been proposed, to mitigate noise impacts
- Buruwan Park acts as a necessary natural noise barrier from traffic and should be retained
- Requests that the road surfaces of Lilyfield Road, City West Link and Iron Cove Bridge be resurfaced to reduce the noise impact from increased traffic in the area
- Open graded asphalt (OGA) cannot be used to gauge the impact of the project as the EIS identifies its use as being subject to a host of other factors and its full cost and benefits have not be fully identified.

Response

Where possible, the project has been designed and planned to avoid and minimise operational noise impacts.

A summary of operational noise measures is provided below and included in full in **Chapter E1** (Environmental management measures). Options to manage operational road traffic noise include the following:

- Where reasonable and feasible, operational noise mitigation such as noise barriers and at-property treatments identified during detailed design would be installed early in the project so as to provide a benefit to receivers during the construction phase of the project (see environmental management measure NV10)
- OGA or equivalent will be investigated during detailed design taking into account whole life engineering considerations and the overall social, economic and environmental effects. If low noise pavement is found to be appropriate, it will be considered as a management measure when assessing operation noise impacts based on the detailed design (see environmental management measure NV11).

The use of noise barriers has been assessed in section 6.5 and Annexure O of Appendix J (Technical working paper: Noise and vibration) of the EIS. The noise assessment outlines the location and required height of these barriers and assesses the potential for other impacts such as those upon residential amenity and urban design generally.

Noise barriers have been considered where four or more eligible properties are found closely spaced. To have a noticeable effect, noise barriers must break the line of sight between the source and receiver. The acoustic performance depends on the degree to which the noise propagation path is interrupted (ie the degree to which the pressure waves must diffract over the top of the barrier). The topography (ground elevation) must be taken into account in the noise barrier design as this has a direct effect on the geometry of the source, barrier and receiver. Sources or receivers in an elevated position may tend to overlook a noise barrier, and this is taken into account in the design.

As a guide, noise barriers are considered to be a reasonable noise mitigation option where they are capable of providing a noise attenuation benefit (referred to as an insertion loss) of:

- 5 dBA at representative receivers for barrier heights of up to five metres
- 10 dBA at representative receivers for barrier heights above five metres high and up to eight metres high.

In certain situations the requirements for the barrier cannot always be met. In this case further feasible and reasonable considerations are undertaken in consultation with Roads and Maritime.

With reference to a requested noise barrier on the north side of City West Link in particular, this is not likely to be effective given the elevated topography of the residential area to the north and the substantial gaps in the barrier that would be created by the new intersections with project roads. This barrier would also result in a poor urban design outcome by blocking views from City West Link into the proposed open space area to be delivered by the project at the Rozelle Rail Yards.

There are no permanent road infrastructure changes proposed at Darley Road and as such it is outside the operational project boundary. Traffic volumes along the section of City West Link at the end of Darley Road are expected to reduce as a result of the project. The removal of vegetation within this area is not expected to change the existing noise levels at nearby sensitive receivers as vegetation generally does not perform well as a noise attenuator, although it is recognised that the attenuation perceived to be provided is important at many locations.

It is acknowledged that Buruwan Park is likely to provide a degree of noise attenuation for the residents of Bayview Crescent and Railway Parade in Annandale. This existing noise attenuation is be partially attributable to the separation that the park provides between The Crescent/City West Link and these properties, particularly those properties nearest the gap in the light rail embankment at the corner of these two streets. The remaining (and likely majority) noise attenuation in this location is provided by the light rail embankment and the existing noise wall along City West Link. During construction it would be necessary to realign The Crescent, bringing it closer to the light rail embankment. This is required to optimise traffic flow into and out of the tunnel portals where they meet City West Link. The realignment of The Crescent would require the removal of Buruwan Park and the removal of a short section of the existing City West Link noise wall. The light rail embankment would not be altered.

During operation, road traffic would be situated immediately adjacent to the light rail embankment. This scenario has been assessed as part of the EIS and shows that five properties on or near the corner of Bayview Crescent and Railway Parade would be subject to minor increases in operational noise during the daytime and night time. These increases would be between 0.5 dBA and 1.5 dBA and are unlikely to be noticeable to residents above existing background levels. As such these increases would not trigger consideration of additional noise mitigation.

The project is predicted to result in a decrease in operational traffic noise for around 60 per cent of receivers within the noise study area, and a minor (less than 2 dBA) noise increase at around 40 per cent of receivers. Despite this is it is recognised that at certain locations there may remain operational traffic noise exceedances in areas adjacent to Victoria Road at Iron Cove, adjacent to Victoria Road at Rozelle and at The Crescent/City West Link intersection. As outlined above, where these exceedances occur, the approach outlined in the Roads and Maritime *Noise Mitigation Guideline* would be followed. This includes consideration of the benefit of low noise pavement, noise barriers and at-property treatments. This process would be fully implemented at the detailed design stage of the project.

C10.13.4 Vibration mitigation measures

Submitters queried what vibration mitigation measures would be available to residents and made suggestions for measures to be implemented during the operation of the project. Specific queries, concerns and suggestions include:

- Assurances that mitigation measures would be in place for residents
- Request for ongoing vibration monitoring to be carried out during the operational phase
- Requests for adequate compensation if future traffic usage of the tunnels causes vibration at properties.

Response

The project is not expected to result in vibration impacts due to project-related traffic or fixed facilities due to the separation of these from sensitive receivers and the attenuation effect provided by the intervening geology.

C10.14 Cumulative noise and vibration impacts

254 submitters raised concerns about the cumulative noise and vibration impacts. Refer to section 26.4.3 of the EIS for details of cumulative impacts and Chapter 6 of Appendix J (Technical working paper: Noise and vibration) of the EIS for the further detail on the noise and vibration assessment.

C10.14.1 Cumulative noise and vibration impacts

Submitters raised concerns about the cumulative impacts of noise from the project. Specific concerns include:

- The cumulative impact associated with aircraft noise which may increase with future airport expansion
- There would be a cumulative impact of aircraft noise with spoil truck diesel engine, exhaust and air brake noise at the Darley Road civil and tunnel site (C4), every four minutes in peak hour based on number of truck movements per hour and in excess of every four minutes per hour in non-peak permitted construction hours
- Cumulative noise impacts from surface and tunnelling construction activities
- A failure to address the cumulative, sequential and parallel noise impacts from multiple sites
- The cumulative noise and vibration impact caused by the overlaps in the construction periods of previous stages of WestConnex and the M4-M5 Link or other concurrent projects.

Response

Aircraft noise and impacts associated with any future developments of Sydney Airport would be addressed and managed by the airports governing authority. While noise from aircraft fly overs is recognised as a feature of the local ambient noise environment (see further response in **Table C10-5**), the assessment of impacts from aircraft fly overs is not required to be assessed for the project, in accordance with relevant noise guidelines.

Cumulative noise impacts from tunnelling (ground-borne noise) and surface works (airborne noise) are not easily assessed as the ground-borne noise criteria is a night-time *internal* criteria and impacts are dependent on the location of the roadheader in relation to the building, as well as the type of construction of the dwelling. The airborne noise criteria is an *external* criteria and as such the level of impact is not dependant on the type of construction of the dwelling. Typically one of either ground-borne noise or airborne noise would be dominant and would render the other less noticeable. As such, these different types of noise generally do not result in a cumulative impact.

The various project construction ancillary facilities and other construction sites are adequately separated such that there would be no static receivers that would experience a cumulative noise impact from two or more project sites that would exceed any NMLs.

During operation, the noise impact from each tunnel portal would be generally highly localised. The noise arising from the portals and the resulting noise cumulative impact have been fully assessed as part of the EIS (refer to the noise contour maps provided in Annexure O of Appendix J (Technical working paper: Noise and vibration) of the EIS). The assessment shows that noise from the various tunnel portals (including those of both the M4-M5 Link and other nearby motorway projects) would not overlap such that cumulative impacts are likely to occur.

It is recognised that residents, businesses and social infrastructure at Haberfield/Ashfield and St Peters would be subject to an extended duration of noise impacts due to the M4-M5 Link project commencing construction before completion of the M4 East and New M5 projects. Chapter 26 (Cumulative impacts) of the EIS comprises a detailed cumulative impact assessment which addresses issues around the extended duration of this impact. Further response to this issue is also provided in **section C14.13.1**. Appendix J (Technical working paper: Noise and vibration) of the EIS includes consideration of consecutive and concurrent impacts during construction and operation of the project. The outcomes of the cumulative impact assessment have informed the development of management and mitigation measures (see **Chapter E1** (Environmental management measures)).

Roads and Maritime acknowledge that the impacts from construction of the WestConnex program of works at Haberfield/Ashfield and St Peters are not short-term, as the consecutive construction of components of the WestConnex projects would extend the duration of impacts to a period of up to seven years for some receivers in these areas. The range and intensity of these extended noise impacts have and would continue to vary as construction of each project progresses in accordance with the stage of construction and the nature of any noisy works required. This includes the potential for both daytime and night-time noise impacts, as well as those arising from utility works which may be undertaken by the utility owner.

Key impacts resulting from longer duration construction in these areas may include noise and vibration, construction traffic, dust, visual impacts and impacts on parking on local streets around construction sites. Construction activities most likely to result in longer duration impacts as a result of 24 hours a day, seven days a week operation or over an extended period of time include surface road works, utility works, tunnelling and tunnelling support (such as spoil handling and transport).

In many instances, M4 East and New M5 construction will transition to less intensive works as the respective construction programs progress towards their conclusion and tunnelling is completed. These less intensive activities include mechanical and electrical fitout, pavement and linemarking works and landscaping, which would occur prior to or at the same time as M4-M5 Link site establishment works commence.

This means that construction activities that overlap or occur consecutively from these projects and the M4-M5 Link would generally be less intensive and cause less disturbance to nearby communities. In addition, these works would typically be expected to require less road occupations (except for linemarking and pavement works) and therefore would be more likely to occur during standard construction hours. In addition, at the completion of construction of the M4 East and New M5 projects, permanent noise treatments would be established and/or installed as required by the conditions of approval for these respective projects. This would include (where required by the conditions) the installation of at-property treatments and the establishment of permanent noise barriers. The noise modelling that has informed these at-property treatments has included the additional traffic forecast for the M4-M5 Link project. These treatments would assist in ameliorating construction noise impacts on these receivers.

Around Haberfield and Ashfield, the majority of the above-ground infrastructure required for the M4-M5 Link project is currently being built by the M4 East project. The large civil construction works such as the construction of the Wattle Street and Parramatta Road entry and exit ramps and the Parramatta Road ventilation facility (including the outlet for the M4-M5 Link project) will be complete or nearing completion before construction of the M4-M5 Link commences. This includes the construction of the M4-M5 Link entry and exit ramps along Wattle Street, including the dive and cut-and-cover structure.

Around St Peters, clean-up of the Alexandria landfill site, construction of the St Peters interchange as well as construction of a component of the above-ground infrastructure required for the M4-M5 Link project is being carried out by the New M5 project. This includes construction of the M4-M5 Link entry and exit ramps, upgrades of the local roads (including Campbell Road) and the civil works associated with establishing a construction ancillary facility.

The M4-M5 Link project will need to carry out some civil construction works (including construction of the Campbell Road ventilation facility) and civil finishing works for infrastructure at Haberfield and St Peters. However, construction of surface infrastructure at both locations as part of the M4-M5 Link project has been minimised as much as practicable.

As described in section 6.4 of the EIS, site establishment activities associated with the M4-M5 Link project would include utility works, vegetation removal, the establishment of traffic management and environmental controls and demolition of buildings and structures to facilitate the establishment of construction ancillary facilities. Although these site establishment works are relatively intense in nature and thus are anticipated to generate amenity related impacts such as noise and vibration, they would typically occur during standard daytime construction hours, with scheduled respite periods that will be implemented in accordance with the conditions of approval and associated environment protection licence. Noise impacts associated with this stage would also be completed early in the construction program and over relatively short durations, typically less than four weeks.

In situations where consecutive long term construction noise impacts occur (arising from other motorway projects alongside the M4-M5 Link), at-property noise mitigation may be considered where feasible and reasonable once options for at-source noise mitigation and management measures have been exhausted. The requirement for at-property noise mitigation would be evaluated in consultation with Roads and Maritime and the community during detailed design, and would be considered when preparing the site specific construction noise and vibration impact statements (CNVIS) for the relevant areas. Feasible and reasonable considerations for providing at-property treatments include:

- The time of day that noise impacts are expected to be active and their degree of exceedance of noise management levels
- The duration of these impacts at the affected receivers
- How long any at-property mitigation would provide benefit to the receiver during the project.

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C11 Human health risk

This chapter addresses issues raised in community submissions associated with the human health risk assessment for the M4-M5 Link project Environmental Impact Statement (EIS). Refer to Chapter 11 (Human health risk) and Appendix K (Technical working paper: Human health risk assessment) of the EIS for further details of the human health risk assessment.

Contents

C11.1 Level and quality of the human health risk assessment

1,014 submitters have raised issues regarding the methodology of the human health risk assessment. The methodology adopted for the human health risk assessment is described in section 11.1 and Appendix K (Technical working paper: Human health risk assessment) of the EIS.

C11.1.1 Level and quality of the human health risk assessment

Submitters raised concern over the level, quality and scope of the human health risk assessment. Specific concerns included:

- Concern with the human health risk assessment in general
- Lack of attention to assessments of impacts on children's health
- EIS does not adequately account for health impacts, this includes:
  - Long-term health impacts on Rozelle, Annandale, Lilyfield, Leichhardt, Haberfield, St Peters residents and travellers
  - Not accounting for the wellbeing of Sydney
  - Effects of pollution on public and mental health
- Consideration of the 'real world' experience from other WestConnex projects
- Figures in the EIS do not include schools raising concern that the project did not adequately consider the potential impacts to children
- Assessment of impacts on the health of inner city residents was insufficient due to the additional vehicles on the roads
- Disagreement that the impact on human health is considered 'acceptable'
- Does not understand the long term health outcomes for the project that are being targeted
- Concerns with regards to the way in which the existing health of local people was taken into consideration
- The assessment has relied on historical risk assessment procedures
- No consideration of known health effects on people, including children, exposed to motor vehicle emissions from the Rozelle interchange, which would be adjacent to 'new' sporting facilities
- Construction fatigue is not adequately explained, assessed or mitigated in the EIS
- Insufficient information on how health impacts will be effectively managed and mitigated.

Response

The methodology for the human health risk assessment involved defining, quantifying where feasible, and assessing the potential risks to human health from the construction and operation of the project. The human health risk assessment addressed the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning and Environment (DP&E).

The assessment focussed on the key impacts on local and regional air quality, in-tunnel air quality for tunnel users, noise and vibration and social changes. The assessment included direct/indirect impacts from construction activities and longer term impacts associated with the operation of the project on the health of the local population and wider Sydney population (eg Rozelle, Annandale, Lilyfield, Leichhardt, Haberfield and St Peters).

Section 11.1.3 of the EIS describes the process for identifying sensitive community receptors and sensitive receivers. Sensitive receivers included infants and young children, the elderly, or those with existing health conditions or illnesses. Sensitive community receptors are the locations where these receivers may spend a significant period of time and include residential properties, hospitals, child care facilities, schools and aged care homes/facilities. Other locations such as areas of open space were also considered.

Section 11.5 of the EIS discusses the potential effects on human health which may result from operational impacts to air quality (eg road traffic emissions at the new interchanges), from noise and vibration and changes to amenity. Potential impacts to health considered in the risk assessment included sleep disturbance, annoyance, hearing impairment, interference with speech and other daily activities, children's school performance, cardiovascular and respiratory health and effects from emissions which are considered to be carcinogens. Other health impacts, but for which the evidence is weaker, have also been considered in the human health risk assessment. These include effects on mental health, cognitive impairment in children and indirect effects such as impacts on the immune system.

In order to quantify the human health impacts, the assessment was based on the findings of the following EIS chapters: Chapter 8 (Traffic and transport), Chapter 9 (Air quality), Chapter 10 (Noise and vibration) and the cumulative assessment which included impacts associated with other WestConnex projects summarised in Chapter 26 (Cumulative impacts).

The following NSW Government agencies and bodies were consulted during the development and preparation of the human health risk assessment for the project:

- NSW Department of Planning and Environment (DP&E)
- NSW Environment Protection Authority (NSW EPA)
- NSW Health
- NSW Office of the Chief Scientist and Engineer
- The NSW Government Advisory Committee on Tunnel Air Quality (ACTAQ).

There has been substantial scrutiny and rigour in the review of the methodology of the human health risk assessment and supporting assessments (ie air quality assessment) completed for the EIS. This included independent peer reviews, including by international experts engaged by ACTAQ. The air quality modelling was reviewed by Sydney Motorway Corporation's (SMC) independent peer reviewers for air quality and ventilation and NSW Roads and Maritime Services (Roads and Maritime) subject matter experts. The EIS, including the air quality assessment report, has been reviewed by specialists from key government agencies including the NSW EPA and NSW Health.

The main findings of the ACTAQ review are that:

'Our overall conclusion of the WestConnex [M4-M5 Link] EIS is that it constitutes a thorough review of high quality. It covers all of the major issues and areas that an EIS for a project of this scale should. The information presented is of suitable detail and logical in order. The choices made regarding data used and methods followed have been logical and reasonable and it is our view that the benefit of exploring alternative approaches would be questionable or marginal…We find that the assessment methodology is sound and represents best practice. All of the models and data used are appropriate and expertly used. We have found no significant omissions, other than lack of inclusion of new information on [oxides of nitrogen] *NOx emissions from late-model diesel light-duty vehicles'.* See **Chapter B3** for an explanation and response to this issue.

The NSW Health review of the M4-M5 Link EIS found that:

'the models used to assess air quality impacts are consistent with those used previously on stage 1b and stage 2 and were considered adequate. NSW Health is satisfied that for this particular project the HHRA [human health risk assessment] *has used a generally appropriate approach for the assessment of human health.'* See **Chapter B1** for an explanation and response to this issue.

The methodology adopted for the human health risk assessment was undertaken in accordance with international guidance that is endorsed or accepted by the Australian health and environmental authorities (refer to section 11.1.1 of the EIS). The project was assessed against the air quality criteria listed in the updated NSW *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA 2016) (updated NSW Approved Methods). The updated NSW Approved Methods adopted the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) standards which were updated in 2016. The national standards were developed to provide 'adequate protection of human health and wellbeing'. Regulators ensure air quality criteria are based on best current knowledge, are set to protect the health of populations and are relevant to the local environment and background levels.

Throughout the consultation process for this project and preceding WestConnex projects, the assessment process and design of the project has been adapted in response to community and stakeholder feedback. Section 7.2 of the EIS provides an overview of how stakeholder and community feedback has been addressed and Table 7-10 of the EIS provides the feedback received and where these issues have been addressed in the EIS. Feedback from government agencies has been addressed in Tables 7-8 and 7-9 of the EIS. In addition, the SEARs, conditions of approval and feedback from the community during construction of the preceding WestConnex projects has informed the human health risk assessment requirements for the M4-M5 Link project.

The definition and methodology for assessing longer duration construction impacts (ie construction fatigue) is described in section 10.8 and section 11.8 of Appendix K (Technical working paper: Human health risk assessment) of the EIS. The assessment has considered longer duration construction impacts arising from noise and vibration and emissions to air from several projects that are not considered to be transient and/or short-term. The key areas, where these impacts may be of concern, both from consecutive and overlapping construction periods, were identified and mitigation measures proposed to minimise these impacts. These measures are described in **Chapter E1** (Environmental management measures).

Further discussion relating to longer duration construction impacts on communities and proposed mitigation measures are provided in **section C14.12**.

The findings of the human health risk assessment relating to construction works are discussed further in **sections C11.3** to section **C11.8** and for operation of the project **sections C11.9** to **section C11.15**.

C11.1.2 Detailed queries about the methodology of the human health risk assessment

Submitters expressed concern about the methodology of the human health risk assessment. Specific concerns included:

- Dehumanisation of human health risk assessment by referring to ‘receivers’
- The use of the term morbidity and the location of the modelling, monitoring and other information in regards to supporting morbidity rates
- Concern with the human health risk assessment cumulative assessment not including:
  - Emissions from the airport and shipping
  - Exposure to consecutive construction at Haberfield and St Peters from the M4 East, New M5 and the proposed M4-M5 Link projects
  - Consideration of the cumulative impact of all the separate negative project risks and how they would impact on the overall resilience and health of inner west communities
  - No proper record and documentation of the health impacts from the M4 East and New M5 project
- The EIS should quantify and consider the cumulative risk to health from air quality and noise sources
- The EIS does not adequately account for health impacts as there is a lack of learning from Stage 1 and 2 of WestConnex on health impacts for Stage 3 [the M4-M5 Link]
- Limited information was provided for impacts on health and safety
- Assessment of impacts on the health of inner city residents was insufficient due to:
  - The 2012 study on the health of residents in proximity of the Lane Cove Tunnel ventilation facilities was not considered
  - The report compiled by a group of respiratory physicians in regards to unfiltered smoke stacks constructed for the NorthConnex tunnel system was not considered
  - The assessment does not point to clear research showing how the project will impact long term on the health of residents living with polluted air
- If the information used for the human health assessment is the most up to date regarding the following:

  - The population estimate used in the human health assessment in respect of expected population figures for the inner west over the period of 2011-2036
  - Sydney Local Health District, which is referred to as Sydney Area Health Service, and other associated information
- Clarification of methodology relating to the maximum calculated risks associated with short-term exposure to changes in nitrogen dioxide (NO_2) concentrations 'without' operation of the project
- The sensitive receivers used in the assessment did not include Orange Grove Public School at Lilyfield and St Columba's Primary School at Leichhardt
- Modelling and/or assessment (eg cost benefit analysis) should include the indirect costs of the impact on the government health system, including exposure to air pollution
- How the modelling for the long-term health effects of the increase in air pollution has taken into account the known increases to lung disease, heart disease and the impairment of brain development in children
- The assessment of impacts of tolls is inadequate and underestimates the health burden it will place on residents for decades
- The information for air emission testing is misleading as truck usage is high in both the morning and night and at night the air is most toxic
- Human health estimates have been conservative in order to not arouse community concerns. This is inappropriate, unjustified and an unscientific approach
- There is no safe level of pollution and the number of deaths and hospitalisations will rise as pollution levels rise
- Objections to the Darley Road civil and tunnel site (C4) as the proponent has failed to minimise the risks to human health.

Response

Specific concerns and responses relating to the assessment methodology of the human health risk assessment are provided in **Table C11-1**.

Table C11-1 Responses to specific concerns relating to the human health risk assessment methodology

Submission concern	Response
Dehumanisation of human health risk assessment by referring to 'receivers'.	'Receivers' refers to residents, workers, recreational and transport users as well as plants and animals in some instances. A collective term is needed to refer to this group which is appropriate to all types of environmental assessments and is broad enough to include this group. The term 'receiver' is internationally recognised and understood in environmental assessment reporting.
The use of the term morbidity and the location of the modelling, monitoring and other information in regards to supporting morbidity rates.	'Morbidity' refers to having a disease or a symptom of disease, or to the amount of disease within a population. The human health risk assessment considered the types of condition and the burden of morbidity across the study population (refer to section 4.5 of Appendix K (Technical working paper: Human health risk assessment)). The study population is largely located within the Sydney Local Health District and the South Eastern Sydney Local Health District. Morbidity rates in this area, compared with other health areas in NSW, and the State of NSW are based on data from 2015 and 2016 from NSW Health.
Concern with the human health risk assessment cumulative assessment not including: • Emissions from the airport and shipping • Exposure to consecutive construction in Haberfield and St Peters from the M4 East, the New M5 and the proposed M4-M5 Link • Consideration of the cumulative impact of all the separate negative risks and how they would impact on the overall resilience and health of inner west communities • No proper record and documentation of the health impacts from the M4 East and New M5 projects.	Emissions from Sydney Airport and shipping activities are included in baseline monitoring recorded at monitoring stations located around Sydney and were therefore captured in the baseline year (2015) scenario presented in the EIS (refer to section 9.2.7 of the EIS). All future year predictions were based on the data modelled for the baseline year. As the air quality assessment supported the human health risk assessment, emissions from these sources were therefore included. The air quality assessment measured changes in ambient air quality across the modelled network and included 86,375 residential, workplace and recreational receptors of which 40 were sensitive community receptors. The study area for the human health risk assessment (refer to section 11.1.2 of the EIS) overlaps with the study areas considered in the M4 East and New M5 projects and is consistent with the area over which impacts on air quality have been considered. The potential health impacts associated with the M4 East and New M5 projects were assessed in the EISs for those projects. Potential cumulative impacts of these projects with the M4-M5 Link are summarised in Chapter 26 (Cumulative impacts) of the EIS. This includes consideration of longer duration construction impacts at Haberfield/Ashfield and St Peters from consecutive construction activities – see **section C14.12.1** for a detailed response to this issue.
The EIS should quantify and consider the cumulative risk to health from air quality and noise sources.	A cumulative risk assessment of air quality and noise impacts was not undertaken because the assessment of noise in NSW is based on guidelines informed by health outcomes. This assessment methodology is different to the way air quality impacts are assessed and therefore the results cannot be combined.

Submission concern	Response
The EIS does not adequately account for health impacts as there is a lack of learning from Stage 1 and 2 of WestConnex on health impacts for Stage 3 [the M4-M5 Link].	Feedback from SMC, design and construction contractor(s), DP&E and other relevant government agencies, including NSW EPA, was sought on the M4 East and New M5 construction processes to identify lessons learnt and areas for improvements to work processes and mitigation measures. This feedback, together with issues raised by the community during the construction stages of those projects to date and during consultation for the M4-M5 Link, has been considered in the preparation of the EIS, particularly in the assessment of cumulative impacts (refer to Chapter 26 (Cumulative impacts) of the EIS). Conditions of approval for the M4 East and New M5 projects informed the environmental management measures for the M4-M5 Link (see **Chapter E1** (Environmental management measures)). Relevant lessons learnt from the M4 East and New M5 projects included additional consideration of equity issues and longer duration construction impacts (refer to sections 11.6.6 and 11.8 of the EIS respectively). In addition, the in-tunnel emissions predicted in the air quality assessment for the future years were estimated using the detailed Permanent International Association of Road Congresses (PIARC) method based on the local fleet emissions factors. This is a change from the M4 East and New M5 EISs which used the simple PIARC method.
Limited information was provided for impacts on health and safety.	Health and safety issues were considered principally in section 11.4.3 of the EIS relating to public safety during construction and section 11.5.3 of the EIS relating to public safety during operation. In addition, public safety relating to hazards (for example, management of chemicals during construction) is also considered in Chapter 25 (Hazard and risk) of the EIS. Public safety risks relating to traffic are presented in Chapter 8 (Traffic and transport) of the EIS.

Submission concern	Response
Assessment of impacts on the health of inner city residents was insufficient due to: • The 2012 study on the health of residents in proximity of the Lane Cove Tunnel ventilation facilities was not considered • The report compiled by a group of respiratory physicians in regards to unfiltered smoke stacks constructed for the NorthConnex tunnel system was not considered	The NSW Health 2012 study[1] examined the respiratory health of residents living near the Lane Cove Tunnel and the impact from pollutants found that *'any risk to respiratory health is minimal.'* The study authors concluded that pollutant concentrations decreased in the immediate area of the ventilation outlets after the tunnel opening, specifically: • The respiratory health effects were identified among residents only for the eastern ventilation outlet, and only for one of the two years examined. No health effects were identified for the western ventilation outlet • Although the identified health effects are difficult to explain, they are unable to be attributed to the ventilation outlet. A study (Pacific Environment Limited (PEL) (2014) comparing the emission rates to pollutant concentrations measured in the ventilation outlets of the Lane Cove tunnel determined that the emission factors previously modelled had overestimated emissions of carbon monoxide (CO) by 1.3 to 1.7 times, emissions of NO_X by 1.6 to 1.8 times, and $PM_{2.5}$ by 2.8 to 4.4 times. While it is noted that the Lane Cove Tunnel has different dimensions and ventilation characteristics to that of the M4-M5 Link, the results for the project are considered to be conservative. The human health risk assessment presented Appendix K examined the effect of air pollution changes on health outcomes including mortality, and cardiovascular and respiratory morbidity. The health outcomes were drawn from national and internationally accepted health endpoints, as outlined in Table 6-22 of Appendix K (Technical working paper: Human health risk assessment) of the EIS. These endpoints have been derived from the most robust scientific literature. The assessment concluded that the air quality impacts were acceptable in relation to the applicable standards.
The assessment does not point to clear research showing how the project will impact long term on the health of residents living with polluted air.	The human health risk assessment for the project has considered national and international research into the long term effects of air quality on the health of residents (refer to Chapter 13 of Appendix K (Technical working paper: Human health risk assessment) of the EIS for the reference list). The findings of the risk assessment included a detailed discussion of the long term operational health impacts (positive and negative) which may arise from the project specifically (refer to section 11.5.1 of the EIS) with respect to volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs), CO, nitrogen dioxide (NO_2) and particulate matter ($PM_{2.5}$ and PM_{10}).

[1] NSW Health (30 November 2012) Respiratory health study findings released on Lane Cove Tunnel.

Submission concern	Response
Is the information used for the human health risk assessment the most up to date regarding the following: • The population estimate used in the human health risk assessment in respect of expected population figures for the inner west over the period of 2011-2036 • Sydney Local Health District, which is referred to Sydney Area Health Service, and other associated information.	Australian Bureau of Statistics (ABS) population data from 2011 to 2016 was used in the human health risk assessment as this was the most up to date data at the time of the assessment. Projected ABS population data cannot be used as these projections are not provided at a small enough population level. Section 4.5 of Appendix K (Technical working paper: Human health risk assessment) of the EIS lists the type and sources of information used. While the Sydney Local Health District was previously known as the Sydney Area Health Service, the information gathered relevant to this area is still valid.
Clarification of methodology relating to the maximum calculated risks associated with short-term exposure to changes in NO_2 concentrations 'without' operation of the project.	Section 3.2.2 of Appendix K (Technical working paper: Human health risk assessment) of the EIS describes the assessment methodology relating to exposure. The existing air environment (including NO_2 levels) as well as the health of the existing population was considered in relation to the key health effects. The assessment considered both acute (short-term) and chronic (long-term) inhalation exposures relevant to the project. Section 3.2.2 of Appendix K (Technical working paper: Human health risk assessment) of the EIS describes the assessment methodology relating to hazard assessment. The objective of the hazard or toxicity assessment is to identify the adverse health effects and quantitative toxicity values or exposure-response relationships that are associated with the key pollutants (such as NO_2 levels) and stressors that were identified and evaluated as part of this assessment. Table 6-13 of section 6.8 of Appendix K (Technical working paper: Human health risk assessment) of the EIS outlines predicted NO_2 levels 'With' and 'Without' the project for 2023 and 2033.

Submission concern	Response
The 'receivers' used for the human health risk assessment did not include Orange Grove Public School at Lilyfield and the St Columba's Primary School at Leichhardt is omitted from the study area of sensitive receivers.	The assessment of potential impacts on the surrounding community, particularly in relation to air quality, has considered the location where maximum impacts from the project may occur. In addition, impacts in the wider community have also been considered. Within the wider community, a number of additional locations, referred to as community receptors, have been identified in the suburbs close to the project. Table 4-1 and Figure 4-2 of Appendix K (Technical working paper: Human health risk assessment) of the EIS show the 40 community receptors included in the assessment. The list relates to receptors considered in the assessment of air quality impacts, for which a quantitative assessment of health impacts has been undertaken. This is representative only and is not intended to comprise an exhaustive list of community receptors in the study area. In addition to these community receptors, 86,375 individual residential, workplace and recreational receptors (also shown in Figure 4-2), have been modelled in the streets/suburbs located in the study area. All these individual receptors have been considered therefore sensitive receptors have been adequately addressed in the assessment. The most impacted sensitive receivers and sensitive community receptors across the study area have been assessed (see Tables 6-16 and 6-23, 6-24 of Appendix K (Technical working paper: Human health risk assessment) of the EIS), and it is this assessment that is determining the acceptability of the project. Therefore, the decisions made regarding health risks will be conservative for other sensitive receptors such as those at Orange Grove Public School at Lilyfield and St Columba's Primary School at Leichhardt, where impacts are predicted to be less.
Modelling and/or assessment (eg cost benefit analysis) should include the indirect costs of the impact on the government health system, including exposure to air pollution.	Monetary evaluation of health costs was undertaken using the NSW EPA methodology for valuating particle impacts, as outlined in section 6.11 of Appendix K (Technical working paper: Human health risk assessment) of the EIS. Section 11.4.4 and section 11.5.1 of the EIS discussed the potential impacts to human health from changes to air quality (both positive and negative). In relation to air quality, dust emissions from construction activities will be managed to ensure that impacts on the health of local communities are minimised. As the larger part of the project alignment would be underground, the operation of the project is predicted to result in a decrease in total pollutant levels in the community. There would be a redistribution of vehicle emissions associated with redistribution of the traffic on surface roads. For much of the community this would result in no change or a small improvement (ie decreased concentrations and health impacts), however for some areas located near key surface roads, a small increase in pollutant concentration may occur. Potential health impacts associated with changes in air quality (specifically NO_2 and particulates) within the local community have been assessed and are considered to be acceptable in relation to the applicable standards.

Submission concern	Response
How the modelling for the long-term health effects of the increase in air pollution has taken into account the known increases to lung disease, heart disease and the impairment of brain development in children.	As the larger part of the project alignment would be underground, the operation of the project is predicted to result in an overall decrease in total pollutant levels in the community. There would be a redistribution of vehicle emissions (including particulate matter, CO, VOCs and PAHs) associated with redistribution of the traffic on surface roads. For much of the community this would result in no change or a small improvement such as decreased pollutant concentrations, reduction in deposition of particulate matter and reduced health impacts. The health data and population trends used in the risk assessment were the most recent available from NSW Health at the time of the study. Section 4.5 of Appendix K (Technical working paper: Human health risk assessment) of the EIS lists the type and sources of information. This data was used as the baseline for analysing potential changes to the health of the population resulting from the project. The health outcomes assessed have been determined from national and internationally accepted health endpoints, as outlined in Table 6-22 of Appendix K (Technical working paper: Human health risk assessment) of the EIS.
The assessment of impacts of tolls is inadequate and underestimates the health burden it will place on residents for decades.	See **section C14.9.2** for responses related to the equity impacts from tolling.
The information for air emission testing is misleading as truck usage is high in both the morning and night and at night the air is most toxic.	Emissions modelling was undertaken for the roads in the study area, as defined in the traffic assessment (refer to Chapter 8 (Traffic and transport) of the EIS). Project traffic modelling included 24 hour traffic volumes including the numbers of trucks during the day and night. The night-time air quality was included in the 24 hour and annual mean assessments for the various air quality criteria as reported in Chapter 9 (Air quality) and Appendix I (Technical working paper: Air quality) of the EIS. This information was then used in the human health risk assessment. Further detail is provided in **section C9.1.3**.
Human health estimates have been conservative in order to not arouse community concerns. This is inappropriate, unjustified and an unscientific approach.	The term ‘conservative’ means that a worst case assessment or the highest potential impacts identified are reported. The approach adopted is therefore expected to overestimate potential impacts, not underestimate impacts. Hence, the calculations presented are considered to be a conservative upper limit estimate.
There is no safe level of pollution and the number of deaths and hospitalisations will rise as pollution levels rise	The project was assessed against current air quality criteria that was based on the national standards developed to provide adequate protection of human health and wellbeing. Regulators ensure air quality criteria are based on the best current knowledge, are set to protect the health of populations and are relevant to the local environment and background levels. In addition to an assessment against the standards, the health consequences of the changes in air quality due to the project were assessed.

Submission concern	Response
Objections to the Darley Road civil and tunnel site as the proponent has failed to minimise the risks to human health	Section 11.4 of the EIS discusses the assessment of potential construction impacts. This comprised an assessment of tunnelling activities and surface works at each construction site (including Darley Road civil and tunnel site (C4)) and construction traffic. The human health risk assessment included consideration of air quality and noise and vibration, for which mitigation measures are provided in **Chapter E1** (Environmental management measures). In addition to the environmental management measures, the project would include acoustic sheds at construction ancillary facilities which would enclose tunnelling activities. An acoustic shed is proposed at the Darley Road civil and tunnel site (C4). This shed would reduce noise and dust being emitted from the tunnelling activities. The covering of truck loads would reduce potential for emissions of dust along haul routes and surrounding residential areas. The effectiveness of control measures would be monitored and adjusted as required. Where the mitigation measures are effectively implemented, impacts on the health of the community would be minimised.

C11.1.3 Concern regarding the adequacy of data used to support the human health risk assessment

Submitters expressed concern regarding the adequacy of data used to support the human health risk assessment. Specific concerns included:

- Reliance of the human health assessment upon air emission modelling
- Air quality assessment is based off the flawed traffic assessment and thus the health impact assessment is questionable
- Assumptions used in air quality, traffic noise and vibration modelling were inadequate for an assessment of impacts on human health
- The human health risk assessment is based on ambient air quality and does not consider the build-up of pollutants inside of homes or classrooms
- The short and long term health costs, as estimated by economic and epidemiological data, and the assumptions underpinning them, cannot be relied upon as a sound basis for confidence in ambient air quality into the future
- The human health risk assessment is based off the concept design and any further changes to the project will change the outcome of the modelling and predictions
- The EIS has made incomplete and inadequate predictions of likely health impacts as a result of the project and has not integrated data related to the now known impacts of the M4 East and New M5 projects.

Response

The methodology for the human health risk assessment presented in the EIS involved defining, quantifying where feasible, and assessing the potential risks to human health from the construction and operation of the project. The assessment focussed on the key impacts on local and regional air quality, in-tunnel air quality for tunnel users, noise and vibration and social changes.

NSW Government agencies and bodies were consulted during the development of the human health risk assessment and technically reviewed the assessment and supporting information. The agencies involved are described in **section C11.1.1**

The findings of the ACTAQ review of the human health risk assessment, is that;

'We find the health risk assessment to be sound and agree with its findings'. See **section B3.3** for the submission and the associated response.

In addition, the traffic assessment for the project based on the WestConnex Road Traffic Model version 2.3 (WRTM v2.3), which has been reviewed by independent experts who have verified its suitability for use.

In order to quantify the human health impacts, the assessment was based on the findings of the traffic assessment (refer to Chapter 8 (Traffic and transport)), air quality assessment (refer to Chapter 9 (Air quality)) and the noise and vibration assessment (refer to Chapter 10 (Noise and vibration)) of the EIS. These EIS chapters outlined the assumptions embedded within future scenarios modelling. The technical reviews by government and independent experts considered the adequacy of the assumptions in relation to the human health risk assessment made within the EIS.

The air quality and human health risk assessment cannot assess the indoor air quality in individual residences as every property would be different based on the lifestyle of a household (eg cigarette smoke, cooking and heating methods, and the materials and integrity of the building and its furnishings). The EIS presents the contribution to air pollutants that the project is predicted to make to the ambient or external air quality prior to the individual contribution from lifestyle choices and other sources of pollutants. Further, the health studies (as identified in Table 6-22 of Appendix K (Technical working paper: Human health risk assessment) of the EIS) used to assess the impacts on air pollution are based on external air pollution measures. It is therefore appropriate to use the same measure when assessing the air pollution impacts.

Feedback received from stakeholders and the community from consultation on preceding WestConnex component projects and lessons learnt from design and construction contractor(s) have been considered in the design of the M4-M5 Link project, the assessment and proposed management of potential impacts. The conditions of approval for the M4 East and New M5 projects informed the minimum requirements for the M4-M5 Link assessment.

The concept design for the project presented in the EIS was assessed using a conservative approach, which included assessing the worst case impacts and scenarios. The design, including tunnels and operational facilities, considered the best available technical information and adopted good practice environmental standards, goals and measures to minimise human health risks. The design presented by the design and construction contractor(s) will need to be consistent with the environmental management measures and conditions of approval for the project. The detailed design will be reviewed against the concept design, EIS and approval conditions, to determine whether further assessment and/or approval would be required under the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). If further assessment/approval is required, the applicable statutory process will be followed prior to the commencement of construction of the relevant aspect of the project.

C11.1.4 Ventilation assessment methodology relating to health concerns

Submitters expressed concern regarding the ventilation assessment methodology relating to health concerns. Specific concerns included:

- Stating that ventilation facilities meet international standards is deceiving. Emission levels should be zero to protect public health. International standard levels of exposure have been dropping for 20 years and are likely to continue to drop as knowledge increases
- The ventilation facilities are being located in areas that are planned to be developed and increase in future population
- Localised impacts of ventilation stacks on health and air quality have not been adequately accounted for
- Concern about the long term health impacts of unfiltered ventilation stacks on the wellbeing of people living in the area, particularly near the stacks
- WestConnex creates a clear public health risk. A WestConnex official confirmed that unfiltered ventilation facilities would lead to 0.2 child fatalities each year – this cannot be called a negligible impact.

Response

Applicable air quality standards in NSW are set by the NSW EPA, having regard to national and international practice, and taking into account local conditions and regulatory requirements. A review of international health-related ambient air quality standards (refer to section 9.2.3 of the EIS) shows that the annual mean $PM_{2.5}$ of 8 micrograms per cubic metre (µg/m^3) is one of the most stringent standards in the world, including the World Health Organization (WHO) standard, and the 24 hour mean $PM_{2.5}$ of 25 µg/m^3 is equal to the lowest international standards. The only particulate standard that is not equal to or lower than any other standard in the world is the current NSW Approved Methods assessment criteria for annual mean PM_{10} standard of 30 µg/m^3 and, although the European Union and the United Kingdom have a higher criterion of 40 µg/m^3, the lowest or most stringent standard for annual mean PM_{10} in the world is Scotland with a criterion of 18 µg/m^3, noting that Scotland has a low background level of particulate matter and this is a realistic standard in that context.

The project was assessed against the air quality criteria listed in the updated NSW Approved Methods (NSW EPA 2016) which adopted the AAQ NEPM standards of 2016. The national standards were developed to provide ‘adequate protection of human health and wellbeing’. Regulators ensure air quality criteria are based on best current knowledge, are set to protect the health of populations and are relevant to the local environment and background levels.

The assessment of the ventilation facilities was described in Annexures I to L of Appendix I (Technical working paper: Air quality) of the EIS. These provide detailed information and assessment of the ventilation facilities and emissions including in the dispersion modelling (the area impacted by emissions) which supported the human health risk assessment. The air quality assessment provides detailed contour plots which map the predicted dispersion modelling for the expected traffic scenarios. These maps are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS and show the dispersion of pollutants resulting from the project along arterial and local roads in the study area.

The air quality and ventilation modelling was reviewed by SMCs independent peer reviewers for air quality and ventilation and by ACTAQ whose findings are shown in **section C11.1.1**. The assessment of the need for filtration determined that there was no beneficial impact on air quality in the surrounding community by implementing tunnel air filtration (refer to section 9.2.3 of the EIS and see additional responses to this issue in **section C9.11.1**). The population considered in the assessment included those who live or work within the vicinity of the ventilation facilities.

The submission referencing '0.2 child fatalities each year' is incorrectly quoting the WestConnex official. Health outcomes for the project are summarised in section 11.5.1 of the EIS.

C11.1.5 Analysis of particulates not adequately assessed

Submitters expressed concern about the adequacy of the human health risk assessment relating to particulates. Specific concerns included:

- The health risk and air quality analysis fails to take into account fine particulate pollution
- $PM_{2.5}$ is not included in modelling as there are no safe thresholds for it
- $PM_{2.5}$ is modelled as safe with levels in the study area close to or above eight micrograms, however the EIS states there is no safe threshold and there is evidence of health impacts
- The ill-health effects of $PM_{2.5}$ on residents of Canada Bay, Sydney, Botany and Burwood requires further analysis and explanation.

Response

The ambient air quality assessment was undertaken against criteria, or levels of pollutants, that have been adopted by the NSW Government. The *Protection of the Environment Operations Act 1997* (NSW) (POEO Act) provides the legislative authority for the NSW EPA to regulate air emissions in NSW. The SEARs for the project refer to the POEO Act and the Protection of the Environment Operations (Clean Air) Regulation 2010 (NSW).

The project was assessed against the air quality criteria listed in the 2016 updated NSW Approved Methods, which adopt the AAQ NEPM standards. The air quality assessment for the EIS did consider particulates PM_{10} and $PM_{2.5}$.

The national standards were developed to provide 'adequate protection of human health and wellbeing'. The AAQ NEPM was amended in February 2016 with the main changes being as follows (National Environment Protection Council (NEPC) 2016):

- The advisory reporting standards for $PM_{2.5}$ were converted to formal standards
- A new annual average PM_{10} standard of 25 $\mu g/m^3$ was established
- An aim to move to annual average and 24 hour $PM_{2.5}$ standards of seven $\mu g/m^3$ and 20 $\mu g/m^3$ by 2025 was included
- A nationally consistent approach to reporting population exposure to $PM_{2.5}$ was initiated
- The existing five-day allowed exceedance of the 24 hour $PM_{2.5}$ and PM_{10} standards was replaced with an exceptional event rule.

Air quality standards in NSW are set with regard to national and international practice, and taking into account local conditions and regulatory requirements. A review of international health-related ambient air quality standards (refer to section 9.2.3 of the EIS) shows that the annual mean $PM_{2.5}$ of 8 $\mu g/m^3$ is one of the most stringent standards in the world, including the World Health Organization (WHO) standard, and the 24 hour mean $PM_{2.5}$ of 25 $\mu g/m^3$ is equal to the lowest international standards.

The maximum total/cumulative concentrations of $PM_{2.5}$ are above the guidelines for both a 24-hour average and an annual average (including the 2025 goal). This is due to the existing levels of $PM_{2.5}$ in air within the current urban environment. These elevated background levels would be present in the community regardless of the construction and operation of the project. Concentrations of total $PM_{2.5}$, however, are essentially unchanged within the local community with the operation of the project.

There are currently no standards for assessment of 'ultrafine' particles (UFPs). These are particles with a diameter of less than 0.1 µm. While there is some evidence that particles in this size range are associated with adverse health effects, it is not currently practical to incorporate them into an environmental impact assessment. There are several reasons for this, including the rapid transformation of such particles in the atmosphere, the need to treat UFPs in terms of number rather than mass, the lack of robust emission factors, the lack of robust concentration response functions, the lack of ambient background measurements, and the absence of air quality standards for this particle type. In relation to concentration response functions, the WHO Regional Office for Europe (2013) has stated the following:

'the richest set of studies provides quantitative information for $PM_{2.5}$. For ultrafine particle numbers, no general risk functions have been published yet, and there are far fewer studies available. Therefore, at this time, a health impact assessment for ultrafine particles is not recommended.'

As UFPs are a subset of $PM_{2.5}$, any potential health effects from UFPs are included in the dose-response functions for $PM_{2.5}$. For the purpose of the project assessment it is considered that the effects of UFPs on health are included in the assessment of $PM_{2.5}$.

Computer models calibrated to local conditions have been used to predict changes in ambient air quality arising from the project and other planned infrastructure projects, so that changes in local and regional air quality can be assessed. The models incorporate meteorology, local topography, the emissions from the future vehicle fleet and the physical characteristics of the motorway, including the tunnel portals and ventilation outlets, and the broader road network.

C11.1.6 Assessment of noise impacts on human health

Submitters raised concern that the health impacts of construction and operation noise have not been sufficiently assessed. Specific concerns include the following:

- The assessment does not measure or mitigate the cumulative impact for prolonged exposure to construction noise. This includes residents that are in construction areas and are exposed to overlapping construction periods from more than one project
- The EIS does not contain references to scientific studies which confirm that the use of construction noise guidelines is appropriate for a project lasting three to five years
- The assessment does not account for high noise levels 75 dbA consistently impacting residents and causing loss of rational behaviour
- Accepting that construction noise levels of 75 dbA are acceptable and can be treated using reasonable and feasible terminology in the *Industrial Noise Policy* (INP)
- Cumulative noise from vehicles, construction plant and equipment and aircraft noise.

Response

The human health risk assessment was undertaken to meet the requirements of the SEARs and has followed the guidelines specified within the SEARs. In particular, the SEARs require that the EIS assess potential human health risks and costs associated with the project, including those associated with noise and vibration on the adjacent and surrounding areas during construction and operation of the project (refer to section 11.4.2 and section 11.5.2 of the EIS). Further discussion regarding potential impacts and management measures relating to longer duration construction impacts is presented in section 14.3.3 of the EIS. **Chapter C14** (Social and economic) also addresses submissions on longer duration construction impacts.

The human health risk assessment assessed the following in relation to noise:

- General construction noise
- Potential noise impacts from movement of construction vehicles
- Ground-borne construction noise

- Blasting
- Operational noise impacts from vehicles
- Operational noise impacts from fixed facilities.

Potential noise impacts have been assessed against NSW criteria that have been established on the basis of the relationship between noise and health impacts. The criteria developed for use in the assessment for control of noise come from policy documents developed by the NSW Government including the INP (NSW EPA 2000), the NSW *Interim Construction Noise Guideline* (NSW Department of Environment and Climate Change (DECC) 2009) and the *Road Noise Policy* (RNP) (NSW Department of Environment, Climate Change and Water (DECCW) 2011). All of these policies are based on the health effects of noise outlined in the reviews published by the following organisations:

- World Health Organization – *Guidelines on Community Noise – Health effects of noise* (WHO 1999)
- World Health Organization – *Night Noise Guidelines for Europe* (WHO 2009)
- International Institute of Noise Control Engineering – *Guidelines for Community Noise Impact Assessment and Mitigation* (I-INCE 2011)
- Environmental Health Council of Australia – The health effects of environmental noise – other than hearing loss (enHealth 2004).

For a number of the noise guidelines (including the RNP), the criteria have been established on the basis of noise annoyance, which is considered to be the more sensitive effect and an effect that precedes the physiological effects. As a result, these guidelines are designed to be protective of all adverse health effects. Other guidelines are based on specific sensitive health effects such as sleep disturbance for the assessment of night-time noise.

As guidelines/criteria that are based on the protection of health are available to assess construction and operational noise impacts associated with this project, the assessment of potential health impacts focused on whether the guidelines/criteria established can be met. Where the guidelines cannot be met, there is the potential for adverse health effects to occur in the community adjacent to the project. Details on potential noise exceedances are provided in sections 11.4.2 and 11.5.2 of the EIS.

Section C11.1.1 discusses the methodology for identifying sensitive receivers and the acute and chronic health risks, including mental health, which are considered in the human health risk assessment.

C11.2 General health impacts

411 submitters have raised issues regarding general impacts to health. Impacts on human health during operation of the project were assessed in Chapter 11 (Human health risk) and Appendix K (Technical working paper: Human health risk assessment) of the EIS. Management measures relating to human health are provided in **Chapter E1** (Environmental management measures).

C11.2.1 General impacts to health

Submitters commented that the impacts of the project on the health and wellbeing of the local community during both construction and operation is unacceptable. Specific health concerns raised included:

- Can the project be designed in a way that takes care of health (both physical and mental) concerns by imposing strict building conditions
- There is a significant health risk to the local community including children and the elderly
- The long-term and future impacts on health to Sydney from the project
- Health impacts from changes to environment
- General concern about carcinogens
- Objection to the Darley Road construction site as it poses a risk to human health.

General health concerns were raised about receivers at the following locations:

- Rozelle School, St Peters Public School, Erskineville School and Newtown School
- Children participating in the school swimming carnival (which is normally held at Drummoyne Swim Centre) due to the proximity of exercising close to the construction site
- Residents at Balmain and Rozelle
- Residents with 50 metres of the road along Euston Road, Sydney Park Road, Mitchell Road, Erskineville Road and King Street.

Response

The human health risk assessment followed national guidelines and addressed the requirements of key government agencies, such as NSW Health, in relation to air quality, noise and vibration, social aspects, public safety and the cumulative effects of construction.

Section 11.1.3 of the EIS described the process for identifying sensitive receptors such as Rozelle Public School, St Peters Public School, Erskineville School and Newtown School. The study area of the human health risk assessment is outlined in section 11.1.2 of the EIS and includes the suburbs of Balmain, Rozelle, Erskineville, Newtown and St Peters. Drummoyne swimming centre is located on the opposite side of Parramatta River from the Iron Cove Link civil site (C8) and therefore is unlikely to be impacted by construction activities from this site.

Section 11.4 of the EIS discusses potential impacts on human health from construction activities which may arise from construction ancillary facilities (such as the Darley Road civil and tunnel site (C4)), construction locations generally and along haul routes. **Sections C11.3** to **C11.8** discuss further potential impacts to human health arising from construction activities.

Section 11.5 of the EIS discusses the short-term and long-term adverse effects on people which may result from operational impacts to air quality, from noise and vibration and changes to amenity. Potential impacts to health include sleep disturbance, annoyance, hearing impairment, interference with speech and other daily activities, children's school performance, cardiovascular and respiratory health and effects from emissions such as VOCs, which are considered to be carcinogens. Other health impacts, but for which the evidence is weaker, have also been considered in the human health risk assessment. These include effects on mental health, cognitive impairment in children and indirect effects such as impacts on the immune system.

The project has been designed with the larger part of the infrastructure underground. The operation of the project is predicted to result in a decrease in total pollutant levels in the community and improve the long term health of Sydney's population. There would be a redistribution of vehicle emissions associated with redistribution of the traffic on surface roads. For much of the community this would result in no change or a small improvement (ie decreased concentrations and health impacts), however for some areas located near key surface roads, a small increase in pollutant concentration may occur. Potential health impacts associated with changes in air quality (specifically NO_2 and particulates) within the local community have been assessed and are considered to be acceptable in relation to the applicable standards.

The air quality assessment also included the following considerations:

- The future development of land (including rezonings) that may involve multi-storey residential buildings above 10 metres high in the vicinity of the St Peters interchange ventilation facilities would need to consider the dispersion performance of the ventilation facilities and follow strict building standards
- While concentrations of pollutants from vehicle emissions are higher within the tunnel (compared with outside the tunnel), exposure to NO_2 inside vehicles is expected to be well within the current health guidelines
- In congested conditions inside the tunnels, it is not considered likely that significant adverse health effects would occur due to the operation of the tunnel ventilation systems and the temporary nature of the potential exposure.

In relation to noise and vibration, potential impacts during construction and operation have been considered. During construction, potential impacts from noise and vibration on the local community would require management and/or mitigation through the implementation of a range of measures. During operation of the project, a number of properties have been identified where specific mitigation measures are required to reduce impacts and protect the health of occupants. These mitigation measures include Open Graded Asphalt or equivalent, noise barriers, and/or at-property acoustic treatment. Management and mitigation measures to address these impacts, where reasonable and feasible, are described in **Chapter E1** (Environmental management measures). No vibration impacts during operation are likely.

Changes in the urban environment associated with the project have the potential to result in a range of impacts on health and wellbeing of the community. Positive impacts include economic benefits, reduction in traffic volumes in some areas, new and improved active transport links and increased public open space.

Management measures would be put in place to address negative impacts that may occur as a result of traffic changes during construction, property acquisitions, visual changes, noise impacts and changes in access or loss of cohesion of local areas, which may result in increased levels of stress and anxiety.

C11.2.2 General impacts to health from changes in air quality

Submitters commented that the impacts of the project on the health and wellbeing of the local community during both construction and operation is unacceptable due to changes in air quality. Specific health concerns related to changes in air quality included:

- Increased air pollution/quality in general
- Concern that air pollution may put the occupants of residents' homes, schools, day care centres and nursing homes at an unacceptable health risk
- The project is exacerbating existing health conditions on asthma sufferers or increasing instances of asthma, respiratory conditions and skins conditions such as asthma and eczema
- Pollutants $PM_{2.5}$ and PM_{10} are classified as carcinogens. People living within 500 metres of heavily affected areas will have shorter lives, higher instances of chronic lung conditions and cardiovascular disease
- Illnesses will be caused such as more frequent colds, allergies, cancers, skin conditions, night terrors, children's development, mental health, sleep disturbance, fatigue, stress
- The project's dust and pollution will cause negative impacts on asthma and allergies. Noise will trigger stress and sleep deprivation. Pollution may cause gastrointestinal issues. Migraines will be exacerbated
- The health impacts of $PM_{2.5}$ emissions
- There is no safe level to exposure to particulate matter of 2.5 microns and less. Particulate matter is linked with Asthma, Lung Disease, Cancer and Stroke
- The combination of road traffic, ventilation facilities and the cruise ships at White Bay.

Response

The project was assessed against the air quality criteria listed in the updated NSW Approved Methods (NSW EPA 2016) (updated Approved Methods). The updated Approved Methods adopted the AAQ NEPM standards which were updated in 2016. The national standards were developed to provide ‘adequate protection of human health and wellbeing’. Regulators ensure air quality criteria are based on best current knowledge, are set to protect the health of populations and are relevant to the local environment and background levels.

Human health risks of the project considered an estimation of health issues that are short-term (acute) and long-term (chronic) impacts during construction and operation of the project. Issues such as asthma, cancers and cardiovascular diseases along with health conditions which may result from stress and anxiety were considered in the assessment. Section 11.1.3 of the EIS described the process for identifying sensitive receivers. Sensitive receivers include infants and young children, the elderly or those with existing health conditions or illnesses. The sensitive community receptors are locations where a significant period of time may be spent such as residential properties, hospitals, child care facilities, schools and aged care homes/facilities. The exposure response relationships for $PM_{2.5}$ and NO_2 mortality used in the human health risk assessment are for all ages, including children and the elderly.

The assessment of construction air quality was carried out using a qualitative assessment approach. For almost all construction activities, significant impacts on receivers would be avoided through project design and the implementation of effective, industry standard mitigation and management measures. However, dust management measures may not be effective all of the time. In situations where the construction air quality management measures are not fully effective, health impacts on the community would generally be temporary and short-term and are not considered to be significant.

As the larger part of the project alignment would be underground, the operation of the project is predicted to result in a decrease in total air pollutant levels in the community. There would be a redistribution of vehicle emissions (including $PM_{2.5}$ and PM_{10}) associated with redistribution of traffic on surface roads. For much of the community this would result in no change or a small improvement (ie decreased concentrations and health impacts). However for some areas located near key surface roads, a small increase in pollutant concentration may occur. Potential health impacts associated with small increases in air quality pollutants (specifically NO_2 and particulates) within the local community have been assessed and were considered to be acceptable in relation to the applicable standards.

A discussion of in-tunnel air quality is provided in **section C11.10.**

C11.3 Construction - air quality impacts on human health

175 submitters have raised issues regarding the impacts construction would have on air quality and human health. The EIS assessed the human health impacts of construction air quality in section 11.4. Impacts on air quality that may occur during construction as a result of tunnelling activities and surface works has been considered in Chapter 9 (Air quality) and Appendix I (Technical working paper: Air quality) of the EIS.

C11.3.1 Dust impacts on human health

Submitters raised concerns regarding health impacts of dust released from tunnelling, associated with heavy machinery and transport during construction. Specific concerns related to:

Dust arising from the following construction ancillary facilities and activities:

- Darley Road civil and tunnel site at Leichhardt
- Muir's sites from demolition work [Parramatta Road West civil and tunnel site (C1b) and Parramatta Road East civil site (C3b)], tunnelling and spoil haulage activity
- Truck movements increasing the amount of dust in the air
- Construction sites in proximity to schools and multiple day care centres
- Tunnelling less than 200 metres away from Haberfield Public School is likely to increase the amount of dust in the air, potentially leading to increased health issues (such as asthma) in students.

The short and long term effects of excessive exposure to dust relating to the following health conditions and population groups:

- Skin conditions including allergies, eczema, sleep deprivation causing night terrors, especially in children
- Particulate matter triggering and accelerating the effects of gastrointestinal inflammatory diseases
- Indirectly causing sleep deprivation, stress and migraines from the dust

- Children, elderly and people with pre-existing health conditions (such as asthma) are more at risk from dust
- Children are more susceptible to learning impairments, heart and lung disease, impacts to early childhood development including cognitive development.

Construction activities impacting the community's health at the following locations:

- Haberfield/Ashfield from excavation, stockpiling and haulage and trucks removing spoil and dust along The Crescent and Booth Street at Annandale
- At Rozelle, the removal of buildings across from Easton Park will increase the strength of winds at properties facing the park on Denison Street
- Schools and day care centres including Rozelle Public School and Billy Kids Early Learning Centre
- King George Park
- Concern that construction dust (potentially contaminated with asbestos, lead and benzoates) will drift towards Haberfield Public School
- Concern that construction Option B will lead to an increase in respiratory illnesses in children.

Response

The assessment of construction air quality was carried out using a qualitative assessment approach. The risks associated with construction dust emissions from all proposed construction ancillary facilities and haul routes were assessed in section 9.6.2 of the EIS. The assessment considered four types of dust generating activity and the main equipment used during demolition, earthworks (including tunnelling), construction, and from construction vehicles exiting construction sites. The assessment methodology considered the risk of health effects due to an increase in exposure to PM_{10}. For human health impacts, the sensitivity of all areas and all activities was determined to be 'medium'.

For almost all construction activities, significant impacts on community receptors and sensitive receivers would be avoided through project design and the implementation of effective, industry standard mitigation and management measures (as outlined in **Chapter E1** (Environmental management measures)). However, dust management measures may not be effective all of the time. In situations where the construction air quality management measures are not fully effective, impacts on the community would generally be short-term and are not considered to be significant.

Sensitive community receptors have been identified in the human health risk assessment (refer to section 11.1.3 of the EIS). These are locations in the local community where more sensitive members of the population, such as infants and young children, the elderly, or those with existing health conditions or illnesses, may spend a significant period of time. These locations may comprise hospitals, child care facilities, schools (such as Haberfield Public School) and aged care homes/facilities. Management measures would prevent significant impact from construction dust affecting these receptors and other sites near construction sites such as King George Park.

Environmental management measures to address potential dust impacts are described in **Chapter E1** (Environmental management measures). A Construction Air Quality Management Plan (CAQMP) will be prepared for the project as a sub-plan to the Construction Environmental Management Plan (CEMP). This plan will describe how the management measures would be implemented during construction to minimise dust and the monitoring and reporting that would be undertaken. Community consultation, including management of complaints, would continue during construction.

In addition to the environmental management measures, the project would include acoustic sheds at construction ancillary facilities which would surround tunnelling activities. Acoustic sheds are proposed at the Parramatta Road West civil and tunnel site (C1b) that is close to the Haberfield Public School and at the Pyrmont Bridge Road tunnel site (C9) that is close to Bridge Road School. These sheds would reduce dust being emitted from the tunnelling activities being undertaken at these locations. Spoil would be transported from construction ancillary facilities to spoil management locations, generally along arterial roads and the M4 East Motorway, the New M5 Motorway, the M5 East Motorway and the M5 South West Motorway. The use of these haulage routes and the covering of truck loads would reduce potential for emissions of dust along haul routes and surrounding residential areas. Spoil haulage routes would take advantage of the M4 East and New M5 tunnels as far as practicable to minimise heavy vehicles using the surface road network.

The effectiveness of dust control measures would be monitored and adjusted as required. Where the dust mitigation measures are effectively implemented, impacts on the health of the community would be minimised.

Five potential construction ancillary facilities have been identified at Haberfield/Ashfield. The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design. See **section C2.1.11** for a detailed response to the selection and approval of construction ancillary facilities. Further discussion relating to contaminants such as asbestos, is provided in **section C11.5.1**.

C11.3.2 Emissions from vehicles and equipment

Submitters raised concerns that increased traffic on surface roads during construction would impact on sensitive receivers, specifically on the health of the following locations and receivers:

- St Peters, Rozelle Public School and Orange Grove Public School
- Sufferers of asthma, allergies and respiratory health, learning impairments, heart and lung disease, gastrointestinal issues, cancers, child development issues, and skin conditions
- High pedestrian area travelling to and from Leichhardt North light rail stop
- Local schools and impacts on children. Children are more at risk and more susceptible to illness, specifically indirect effects from dust causing lack of sleep and triggering night terrors and physical health, stress levels and impact on those with pre-existing respiratory conditions.

Specific concerns were raised relating to the following activities:

- Darley Road civil and tunnel site - steep section of road at Darley Road/James Street in peak hour traffic will cause a high concentration of diesel exhaust emissions
- The use of generators on construction sites are dangerous to human health
- Diesel fumes containing particles such as NO_2
- Increased vehicle emissions from traffic congestion (including trucks) due to construction activities.

Response

The risks associated with exhaust emissions from construction traffic and diesel powered equipment from all proposed construction ancillary facilities and spoil haulage routes were assessed in section 9.6.2 of the EIS. The assessment considered construction vehicles exiting construction sites and using haul routes. Construction ancillary facilities for the project as well as proposed spoil haulage routes are along busy arterial roads, which already experience poor ambient air quality from existing traffic. The air quality assessment considered the following pollutants: CO, NO_2, PM_{10}, $PM_{2.5}$ and air toxics (Benzene, PAHs Formaldehyde, 1,3-butadiene). The human health risk assessment considered potential health risks associated with VOC, PAH and CO with a more detailed evaluation of exposures to NO_2 and particulate matter emissions within the surrounding community.

The contribution of construction related heavy and light vehicle traffic would be relatively minor compared to existing background traffic flows and therefore potential increases in emissions would be minor.

The use of mains electricity will be favoured over diesel or petrol-powered generators where practicable to reduce site emissions. Engine idling will also be minimised when plant is stationary, and plant will be switched off when not in use to reduce emissions. Significant impacts on receivers from construction traffic and equipment (ie particulate matter and NO_2 from exhaust emission or residual dust emitted from vehicles) would be avoided through the implementation of effective, industry standard mitigation and management measures (see **Chapter E1** (Environmental management measures)).

A discussion relating to construction dust is provided in **section C11.3.1**.

A discussion relating to stress and anxiety, including impacts on children, is provided in **section C11.16**.

C11.3.3 Concerns for human health from odours

Submitters raised concerns for human health from odours released during construction. Specific concerns were:

- Continuing odours at St Peters, including the smell of hydrogen sulphide, being damaging to the community's health
- Odours released from the Darley Road civil and tunnel site will have detrimental impacts on human health.

Response

Odour in itself would not have a significant impact to human health. It can however indicate the presence of pollutants in the air. The air quality impact assessment (refer to section 9.9 of the EIS) included consideration of odours created by the project during construction. The assessment considered the change for three of the odorous pollutants identified in the NSW Approved Methods (toluene, xylenes, and acetaldehyde). These pollutants were taken to be representative of other odorous pollutants which could occur in motor vehicle emissions.

The findings of the assessment predicted the change of each pollutant was an order of magnitude below the corresponding odour assessment criterion in the NSW Approved Methods. Therefore it is unlikely that odour would be noticeable to receivers from project construction activities.

Table 4-18 of Appendix R (Technical working paper: Contamination) of the EIS lists potential contamination at the Darley Road civil and tunnel site (C4). Contamination could include hydrocarbons which may have an odour. Removal of contaminated material would be managed through the Construction Waste Management Plan for the project which will include procedures for handling and storing potentially contaminated substances.

Odour issues that have been experienced at St Peters are likely associated with the New M5 project. The M4-M5 Link would not involve excavation works in the former landfill at St Peters. See **section C29.1** for issues raised relating to the New M5 project. These impacts were assessed in the EIS for that project (Roads and Maritime 2016).

C11.4 Construction - noise and vibration impacts on human health

1,062 submitters have raised issues regarding noise and vibration impacts to health. The EIS assessed the human health impacts of construction noise and vibration in section 11.4. Further detail on the noise and vibration assessment is provided in Chapter 10 (Noise and vibration) and Appendix J (Technical working paper: Noise and vibration) of the EIS.

C11.4.1 Impacts to human health from construction site noise and vibration

Submitters raised concern that noise and vibration impacts to residents during construction of the project would be at unsafe levels that can impact health. Specific concerns relating to health impacts were as follows:

- Concern about 24/7 noise and vibration from construction activities such as road works, machinery and construction traffic
- Extending daytime hours into night works when schedules fall behind causing interruptions and lack of sleep for local residents
- Excessive noise greater than 75 dBA over an eight hour period can cause health impacts at Rozelle in addition to impacting quality of life
- Construction activities occurring within 500 metres of schools and day care centres
- Construction activities at the Darley Road site, St Peters interchange [Campbell Road civil and tunnel site] and Camperdown site [Pyrmont Bridge Road tunnel site] opposite Bridge Road School
- Loss of sleep (fatigue, night terrors, sleep disorders, stress), general ill-health (eg tinnitus, migraines, Alzheimer's disease, increased blood pressure, risk of heart attack and stroke) and mental health (eg depression, dementia) and loss of productivity at work and school (general mental and physical health)
- Impact on health and wellbeing of children in proximity such as causing learning difficulties, emotional and behavioural problems and affecting early childhood development

- Shift worker vulnerability to sleep disturbance during the day causing loss of quality of life and productivity and inducing chronic mental and physical illness, especially in those with pre-existing respiratory conditions.

Response

Project designed to minimise noise impacts

In developing construction methodologies and a construction program for the project, the aim is to minimise the duration of the construction period while maintaining an acceptable and manageable amenity outcome for surrounding receivers. This requires a balance between the speed of construction activities and the ability to reasonably and feasibly manage potential impacts within acceptable noise limits. Opportunities to reduce overall construction timeframes while protecting local amenity will be considered during detailed design and construction planning in consultation with key stakeholders and the community.

Construction traffic would generally be expected to travel via existing arterial roads (figures showing spoil haulage routes are provided in Chapter 6 (Construction work) of the EIS) and in **section C4.18.1** for the amended Darley Road civil and tunnel site (C4) route). Some temporary use of local roads such as Lilyfield Road would be required during site establishment of construction ancillary facilities at Rozelle, but this would be a low volume of vehicles and temporary during site establishment only. No local roads would be used for spoil haulage. In addition, to minimise noise from heavy vehicle queuing to enter construction sites, a truck marshalling facility is proposed at the White Bay civil site (C11) at Rozelle. This site would cater for around 40 heavy vehicles and would stage the release of trucks to the tunnelling sites to manage the arrival of trucks at the construction ancillary facilities (see **Chapter D2** (White Bay civil site (C11)). The M4 East and New M5 tunnels will be used for spoil haulage when they become available and where practicable, to minimise heavy vehicle movements and associated traffic noise on the surface road network.

Noise and vibration impact assessment

Potential increases in noise and vibration from the construction ancillary facilities (including the Darley Road civil and tunnel site (C4), Campbell Road civil and tunnel site (C10) and Pyrmont Bridge Road tunnel site (C9)) and other construction locations has been considered for sensitive members of the population (such as children). The noise assessment study area extended to a boundary of 600 metres either side of the construction traffic routes, as recommended in the RNP (DECCW 2001). Impacts are considered particularly for sensitive locations such as residential properties, hospitals, child care facilities, schools and aged care homes/facilities where people may spend a significant period of time.

The worst case assessment predicts that during construction, noise criteria will be exceeded at a number of properties adjacent to the project footprint, as well as vibration criteria for human comfort.

The noise modelling addresses the worst case situation therefore predicted noise levels are conservative and would not occur continuously for long durations. The *Interim Construction Noise Guideline* (ICNG) (DECC 2009) considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be 'highly noise affected' (refer to section 10.3 of the EIS). Activities that may result in 'highly noise affected' receivers are expected to occur for a relatively short period of time, not continuously for eight hours. Also the use of the most noise intensive equipment would only sporadically be required at times throughout the duration of works.

Some items of equipment to be used during construction have the potential to cause levels of vibration which could cause discomfort to some sensitive receivers. Measures to minimise this impact during construction are described in **Chapter E1** (Environmental management measures).

Section 10.3 of the EIS presents the results of the construction noise assessment. Further discussion relating to construction noise impacts is provided in **section C10.3** to **section C10.8**.

Human health risk assessment

The predicted worst case noise levels prior to mitigation measures are sufficiently high for some receivers during certain works that health impacts could occur when subjected to repeated exposure and if impact is left unmitigated. These properties are located south of Victoria Road adjacent to the Iron Cove Link tunnel portals, and to the west of Victoria Road near Lilyfield Road. These are primarily related to the new Victoria Road alignment being closer to residential homes, and the removal of buildings closest to the road (that previously provided a barrier to noise from the roadway). A number of properties have also been identified where cumulative noise impacts exceed the relevant guidelines. The management and mitigation of noise and vibration impacts during the construction are described in **Chapter E1** (Environmental management measures).

Further, activities that may result in 'highly noise affected' receivers are expected to occur for a relatively short period of time and that the use of the most noise intensive equipment would only be required sporadically at times throughout the duration of works.

The EIS considers health effects arising from stress and anxiety in section 11.9 of the EIS. To address potential health impacts such as stress and anxiety which may result from construction noise or vibration, mitigation measures have been identified and will be included in the Construction Noise and Vibration Management Plan (CNVMP) which will be a sub-plan to the CEMP. Further discussion relating to stress and anxiety is provided in **section C11.16.**

Management measures

Noise and vibration management measures are outlined in **Chapter E1** (Environmental management measures). These measures, along with additional measures to manage specific impacts, will be included in the CNVMP (see environmental management measure NV2 in **Chapter E1** (Environmental management measures). Receivers that qualify for assessment for at receiver treatment in relation to operational noise, that are also predicted to experience significant exceedances of noise management levels due to construction, will be given priority preference for assessment for treatment based on the severity and timing of impact. Where the building owner accepts the at receiver treatment proposal, the treatments will be installed as soon as possible (see environmental management measure NV9 in **Chapter E1** (Environmental management measures)).

Noise mitigation measures identified to minimise road traffic noise impact will also be implemented as early as practicable to minimise construction noise impacts (see environmental management measures NV10 in **Chapter E1** (Environmental management measures)). Construction noise and mitigation measures would be further reviewed and detailed as part of the CNVMP.

Consultation with individuals would occur in relation to predicted exceedances to construction noise management levels, which would provide an opportunity for the project to better understand issues such as impacts to shift workers and to allow mitigation measures to be tailored accordingly.

An out-of-hours works protocol will be developed for the construction of the project and will form part of the CNVMP (see environmental management measure NV5 in **Chapter E1** (Environmental management measures)). Work outside standard construction hours is regulated by the NSW EPA through the environmental protection licence. There are very specific circumstances that justify works outside standard construction hours, as defined in the ICNG (DECC 2009). A construction program falling behind schedule is not considered to be adequate justification for works outside standard construction hours. In addition, the *Construction Noise and Vibration Guideline* (Roads and Maritime 2016), which outlines Roads and Maritime's approach to managing and mitigating construction noise, will be followed by the design and construction contractor(s). These guidelines are considered in addition to other relevant policy and guidelines from the NSW EPA.

C11.4.2 Noise and vibration impacts on health from tunnelling activities

Submitters raised concerns over the noise and vibration caused by tunnelling activities. Specific issues raised were as follows:

- Concern over health impacts due to 24 hour a day tunnelling resulting in lack of sleep and impacting mental health and comfort including increased stress
- Concern relating to impacts at the interchange at Leichhardt-Rozelle.

Response

Tunnelling would produce ground-borne noise and may require blasting activities resulting in ground-borne noise and vibration. The tunnelling activities would take place at depth (with a large proportion of the mainline tunnels at depths between around 30 to 65 metres), where activities are expected to occur 24 hours per day. The roadheader excavation would typically progress at around 20 to 25 metres per week subject to local geology and confirmation of the tunnel excavation methods. Tunnel excavation may require several passes in order to complete, including for cross passages, stormwater/utility trenches and tunnel benches. There is, however, some flexibility in the timing of all non-roadheader works such that these could be scheduled during standard construction hours, where reasonable and feasible. Further detail relating to ground-borne noise from tunnelling at Leichhardt and Rozelle is provided in **section C10.5**.

Noise impacts above acceptable levels, as defined by the NSW EPA, have been identified at a number of residential receivers (383) located above the mainline tunnel alignment. The greatest impacts relate to works in the vicinity of the Rozelle interchange where the tunnel ramps climb to meet City West Link, with exceedance of night-time ground-borne noise criteria predicted. Other impacts, where there are exceedances of day and night-time criteria, are in the vicinity of the Iron Cove Link (where tunnel ramps climb to meet Victoria Road) and St Peters interchange. The duration of these impacts is estimated to be around two weeks.

The noise modelling addresses the worst case situation when the tunnelling would occur immediately beneath a sensitive receiver. Exceedance of the night-time criteria was identified for sensitive receivers near key construction areas, specifically the Darley Road civil and tunnel site (C4) (with exceedance up to four dBA) and the Pyrmont Bridge Road tunnel site (C9) (with exceedance up to five dBA). Exposed receivers may suffer minor discomfort, anxiety or sleep disturbance resulting from the activities. Further discussion relating to out-of-hours noise impact from tunnelling is provided in **section C10.8.** In reality, ground-borne noise levels would increase as tunnelling approaches a receiver and decrease as it moves away. Ground-borne noise would not be continuous at any location over the duration of the project.

Section 11.9 of the EIS considers health effects of construction impacts arising from stress and anxiety (refer to section 11.9 of the EIS). Further discussion relating to stress and anxiety is provided in **section C11.16**.

If blasting is determined to be required by the design and construction contractor(s), it would be planned to ensure blast limits are satisfied. Blasting would be undertaken during reduced standard construction hours (between 9.00 am and 5.00 pm, Mondays to Fridays and 9.00 am to 1.00 pm on Saturdays) and would be subject to the provision of respite periods. A description of how blasting would be carried out is provided in Chapter 6 (Construction work) of the EIS. While blasting may result in perceptible ground-borne noise, it could avoid prolonged ground-borne noise from excavation using other plant and equipment such as roadheaders and rockbreakers, for which progress would be slower than blasting. This would minimise the duration of noise impacts to sensitive receivers. Further detailed assessment and a blast trial process would be described in a Blast Management Strategy, which will be prepared during the detailed design stage of the project (refer to section 10.3.7 of the EIS).

To address potential health impacts such as sleep disturbance, stress and anxiety which may result from ground-borne construction noise or vibration, mitigation and management measures have been identified to minimise predicted impacts. Management measures are outlined in **Chapter E1** (Environmental management measures) and further discussion of construction noise related mitigation measures is provided in **section C10.8**.

C11.5 Construction - public safety impacts on human health

245 submitters have raised issues regarding impacts to public safety during construction. Public safety during construction of the project is issued in section 11.4 and Appendix K (Technical working paper Human health risk assessment) of the EIS.

C11.5.1 Construction public safety impacts on human health

Submitters raised concerns over public safety issues during construction. Specific issues included:

- St Peters community would be exposed to dangerous work practices, impacting health and wellbeing
- Iron Cove Link civil site poses a safety risk to children using King George Park from the use of heavy plant equipment
- Concern construction within 500 metres of Rozelle Public School between 7.00 am and 6.00 pm Monday to Friday will result in adverse safety effects on children due to its proximity
- Concern that soil along Victoria Road, Iron Cove Bridge and Anzac Bridge is contaminated by lead and that during construction activities this will be disturbed and lead to potential health impacts. Especially since children are present around this area
- Concern for the St Peters community being exposed to asbestos and other dangerous substances as the site has not been cleaned
- Concern that contaminants from the Darley Road site will be disturbed, removed, transferred and handled posing a health risk to the community including children. These contaminants include asbestos, silica, polycyclic aromatic hydrocarbons, total recoverable hydrocarbons and volatile organic hydrocarbons
- Concern that the building at the Darley Road site has asbestos, which will become a risk to the community from its demolition
- Concern with potential contaminants at the sites, including the prior car yard at Option B, including asbestos, lead, metals, benzene and pesticides and the potential health risk to the community and Haberfield Public School within 200 metres of construction activity
- Concern that noxious gas and asbestos could be released during construction
- Concern for workers and the community exposed to anthrax from contaminated land.

Response

A range of possible hazards have been identified (refer to section 11.4.3 of the EIS) that have the potential to affect public safety during construction. These are outlined in **Table C11-2** along with discussion on the risks that may be posed by these hazards and proposed management measures. Further detail of measures to prevent risks to public safety would be developed during detailed design.

Table C11-2 Overview of public safety hazards and risks: Construction

Hazard: Public safety	Risk to public safety	Management measures
Heavy vehicle movements would involve the use of major roads including Parramatta Road, City West Link, Victoria Road, Pyrmont Bridge Road and the Princes Highway. Traffic and trucks on surface roads and crossing into construction sites have the potential to increase the risk to road safety due to road incidents. Changes to the surface road network may require temporary traffic detours confusing road users.	**Low** Potential injury to road users resulting from an incident involving a construction vehicle.	Construction road traffic volumes would be low compared with existing traffic volumes, which is not expected to significantly impact on road safety. All traffic detours would be undertaken in accordance with approvals by Roads and Maritime, local councils and the Transport for NSW Transport Management Centre. Property access would be maintained, or alternative access provided. A Construction Traffic and Access Management Plan (CTAMP) would be prepared as part of the CEMP to manage these impacts.
Changes to local roads and active transport pathways may affect pedestrian and cyclist safety. Construction and surface road works may require detours by pedestrians and cyclists but these would be temporary. Access routes into construction sites across pedestrian or cyclist routes with potential for collision with a construction vehicle.	**Low** Potential injury to cyclists or pedestrians from incident involving a vehicle. Potential injury to cyclists or pedestrians from use of a detour route.	Alternative safe pedestrian and cyclist access would be provided where it is practical and safe to do so. This would be addressed in the CTAMP.
Incidents from mobile construction plant: • Plant overturning • Objects falling from plant • Plant colliding or coming into contact with any person or object (eg workers, other vehicles or plant, energised powerlines).	**Low** Potential injury to road users, nearby pedestrians or damage to personal property.	Mobile plant on construction sites would be operated in accordance with *Moving Plant on Construction Sites: Code of Practice* (SafeWork NSW 2004). This would be addressed in the CTAMP.
Storage and handling of dangerous goods on construction sites that may impact the community in the case of a spill or leak.	**Low** Potential contamination migrating off site and impacting surrounding soils or water quality. In the event of an incident, there would very low potential for an off-site risk.	The storage volume of dangerous goods on any one construction site would be low. All materials would be stored in accordance with the Australian Standards that include the use of bunding, ventilation of areas where gases are stored, locating stores of these materials away from sensitive areas, and maintaining a register and inventory.

Hazard: Public safety	Risk to public safety	Management measures
Incidents related to the transport of dangerous goods and hazardous substances on public roads.	**Low** Potential injury to road users, nearby pedestrians. Potential contamination from spills impacting surrounding properties, soils or water quality.	The quantities and frequency of transport for these chemicals is low. All transport would involve using trucks that are suitable to transport these materials, with procedures in place to manage any leaks or spills during an accident. All materials would be transported in accordance with the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW 2005), *Dangerous Goods (Road and Rail Transport) Act 2008* (NSW), Dangerous Goods (Road and Rail Transport) Regulation 2014 (NSW) and relevant Australian Standards.
Release of asbestos and other contaminants such as lead paint where contamination already exist in buildings to be demolished and soils to be excavated. This may result in contaminants being emitted to the air, migrating off-site onto neighbouring properties or into waterways.	**Low** Exposure to asbestos during construction may result in health risks for people in neighbouring communities.	Removal of asbestos would be required to be undertaken in accordance with procedures detailed in an Asbestos Management Plan for the project, which meet national legislation and guidance. This would involve suitably qualified experts and would include notification requirements to communities and relevant stakeholders. Standard environmental management measures will manage other contaminants which may arise during construction and demolition activities (see **Chapter E1** (Environmental management measures).
During construction and demolition activities, airborne pollutants have the potential to be generated, including dust and toxic gas. The operation of diesel and petrol-fuelled equipment and the use of hazardous materials also have the potential to produce a range of air contaminants, including diesel particulate matter from diesel combustion.	**Low** Emissions may result in oxygen deficient or toxic environments and other potential health risks for the local community members.	Standard environmental management measures will manage any contaminants which may arise during construction and demolition activities (see **Chapter E1** (Environmental management measures).

Hazard: Public safety	Risk to public safety	Management measures
There is a risk posed from contact with anthrax spores to occupations dealing with contaminated land, including works on sites where anthrax infected carcases may be buried or an old tannery.	**Low/negligible** NSW Department of Primary Industries (2017) has identified the areas where anthrax has been known to be present in NSW. This does not include the Sydney area. NSW Health indicates that human infection from spores in soil is unlikely as a large concentration of spores is needed for infection to occur. NSW Health also notes that Anthrax is a very rare disease in humans, with only 3 cases reported in NSW since 1982. WHO (2008) had determined there is a very low risk to human health for construction workers on potentially contaminated soil.	Risk assessment has identified no need to implement any additional management measures, above those required to address the presence of other contaminants in soil, to minimise risks for workers on the site or the surrounding public.

C11.6 Construction - impacts on health from changes to traffic and transport

Two submitters raised concerns that changes to traffic and transport during construction would have impacts on the health of the community. These impacts are discussed in section 11.6 and Appendix K (Technical working paper Human health risk assessment) of the EIS.

C11.6.1 Human health impacts from changes to traffic and transport during construction

Submitters raised concerns that changes to traffic and transport during construction of the project would cause impacts on the health of the community. Specific concerns include suburbs that are closely settled with narrow roads and limited road transport corridors will experience traffic disruptions from large scale construction, causing adverse health effects on the community.

Response

A number of changes to local roads are proposed during the construction phase of works (refer to section 8.3.1 of the EIS). While access to all properties on the local roads would be maintained during the construction works, some permanent and temporary closures or reduced capacity of some local roads may affect the movement of local traffic through the area. In relation to traffic changes around the project footprint during construction, most of the issues that are relevant to community health relate to public safety (see **section C11.5.1**).

In addition to safety risks to the public, construction works are expected to result in some changes to existing routes and increases in travel times for motorists, bus travel, pedestrians (including children on route to school) and cyclists. Construction activities would result in the relocation of some bus stops and bus travel times are forecast to increase along some routes in the peak periods.

During construction, heavy vehicles would generally travel via existing arterial roads, therefore minimising impacts to local roads and their surrounding communities. The volume of construction traffic would be low compared with existing traffic volumes and this is therefore not expected to result in significant impacts. The construction ancillary facilities have been designed with direct access to the arterial road network so that spoil trucks would not use local roads.

In addition, to minimise noise from heavy vehicle queuing to enter construction sites, a truck marshalling facility would be provided at the White Bay civil site (C11) at Rozelle. This site would cater for around 40 heavy vehicles and would stage the release of trucks to the tunnelling sites to manage the arrival of trucks at construction ancillary facilities. This is described further in **Chapter D2** (White Bay civil site (C11)). The M4 East and New M5 tunnels will be used for spoil haulage when they become available and where practicable, to minimise heavy vehicle movements and associated traffic noise on the surface road network.

The CTAMP prepared for the project, will include the guidelines, general requirements and principles of traffic management to be implemented during construction (see environmental management measure TT01 in **Chapter E1** (Environmental management measures)). A Community Communication Strategy will also be prepared for the project that will detail procedures for distributing information to the community and receiving/responding to feedback. It will also outline procedures for resolving stakeholder and community complaints during construction.

For these and other mitigation measures for managing construction traffic, please see **Chapter E1** (Environmental management measures).

Impacts on air quality from construction traffic are discussed in **section C11.3.2**. The contribution of construction related heavy and light vehicle traffic would be relatively minor compared to existing background traffic flows and therefore potential increases in emissions would be minor.

C11.6.2 Human health impacts due to the disruption of pedestrian and cyclist access during construction

Submitters raised concerns that disruptions to access of pedestrian and cycle paths would impact the physical and mental health of the community.

Response

During construction, alterations to pedestrian and cyclist networks have the potential to affect user departure times, travel durations, movement patterns and accessibility. Construction of the project would result in changes to pedestrian and cyclist access, including temporary and permanent closures or diversions of some pathways and pedestrian bridges. However, alternative routes of travel would be maintained (refer to section 8.3.1 of the EIS).

While the opportunity to walk or cycle in the vicinity of the project footprint would be maintained, the alterations and changes to amenity may detract from the experience of the environment and potentially deter people from enjoying an active lifestyle or feeling connected with their community. Public safety will be a major consideration in the development of alternative pedestrian and active transport routes and diversions. Management measures would be implemented to minimise impacts on pedestrian paths and cycle lanes, and provide timely alternatives during construction, where practical and safe to do so.

Once completed, the M4-M5 Link project includes a range of changes to the active transport network in the area of the Rozelle Rail Yards (including links from Anzac Bridge to The Bays Precinct and Victoria Road, and through the Rozelle Rail Yards), Johnstons Street Link, Victoria Road, Iron Cove Link, Whites Creek Link and Johnston Creek Valley Link. Some of the proposed active transport improvements are to be completed in combination with other projects proposed in these areas. A strategy for active transport has been developed for the project (refer to section 5.5 and Appendix N (Technical working paper: Active transport strategy) of the EIS).

Improvements in the active transport network, including improvements in transport connections, would have a positive benefit on community health. Where active transport opportunities are improved and offer safe alternatives to driving and public transport, they can encourage more active recreation and commuting activities.

C11.7 Construction - impacts on health from changes to open space

Seven submitters raised concerns that changes to open space during construction would have impacts on the health of the community. These impacts are discussed in section 11.6 and Appendix K (Technical working paper Human health risk assessment) of the EIS.

C11.7.1 Loss of or impacts to open space impacting on human health

Submitters raised concerns with the loss of or impacts on open space. Specific concerns included:

- Impacts to Buruwan Park, an area used for bike riding, commuting and dog walking. The trees provide clean air and act as a noise barrier
- Callan Park will be lost and its associated area for sporting activities
- Simpson Park will no longer be a viable open space due to changes in amenity from increased noise and changes to air quality
- Impact to King George Park and the health impacts to its users, including children. The park is their only means of recreation due to the lack of safe open spaces at Rozelle for children to play
- Submitters raised concerns with the health impacts from air pollution around new and existing open spaces and active transport links.

Response

There are a number of sporting/recreational facilities and parks in and around the project footprint that include sporting fields, playgrounds, parks and reserves. The project has been designed to minimise the use of and impacts to public open space.

The project would not directly impact on Callan Park or Simpson Park. It would also not impact on the new park at The Crescent, adjacent to the existing Johnston Creek parklands, proposed by City of Sydney Council.

The project has been designed to minimise the need for land acquisition, where feasible and reasonable. In order to prevent the impact on private property, some public land, including open space, would be required to facilitate construction of the project, resulting in permanent acquisition of green space.

Table C11-3 Summary of impacts to open space during operation

Location	Land use (type)
Haberfield and Ashfield (C1a, C2a, C3a, or C1b, C2b, C3b)	None. Delivery of new open space in accordance with the M4 East Urban Design and Landscape Plan (UDLP).
Darley Road civil and tunnel site (C4).	None.
Rozelle civil and tunnel site (C5), The Crescent civil site (C6) and Victoria Road civil site (C7)	Buruwan Park would be occupied by permanent operational infrastructure (including the new alignment of The Crescent). This park would no longer exist when construction of the project is complete. The project would deliver new open space within the Rozelle Rail Yards in accordance with the UDLP to be prepared for the project. This would be a positive impact, and of benefit to the community.

Location	Land use (type)
Iron Cove Link civil site (C8)	Permanent occupation of a section of King George Park immediately south of Iron Cove Bridge approach for the widened westbound Victoria Road carriageway and road embankment. There are no active open space areas or playground facilities that would be permanently impacted. The project would deliver new open space at this location in accordance with the UDLP to be prepared for the project. This would be a positive impact, and of benefit to the community.
King George Park bioretention facility	Temporary diversion of the Bay Run to facilitate construction of the bioretention facility.
Pyrmont Bridge Road tunnel site (C9)	None.
Campbell Road civil and tunnel site (C10)	None. Delivery of new open space in accordance with the New M5 UDLP.

The project has committed to delivering up to 10 hectares of open space at the Rozelle Rail Yards. The concept plan for the urban design and landscaping outcome at the Rozelle Rail Yards would be further refined during detailed design and would have regard to identifying opportunities to deliver outcomes that support and connect existing neighbourhoods, complement and stimulate local economies and provide opportunities for growth across existing and future local industries along and around Victoria Road at Rozelle. This could include provision of community and social infrastructure such as sporting fields and other active recreational facilities, to be delivered by others, and would be determined through consultation with relevant stakeholders and the community. The process for finalising the urban design and landscaping outcome would be detailed in the relevant UDLP that would be prepared for the project.

These additional or improved open space areas would provide the community at Rozelle with increased opportunity for active recreational activities and increased open space, potentially improving health and opportunities for social interaction and cohesion.

In the area around Wattle Street and Campbell Road, the project will deliver new open space areas in line with the M4 East and New M5 UDLPs.

As the larger part of the project alignment would be underground, the operation of the project is predicted to result in a decrease in total pollutant levels in the community and therefore at local public open spaces. There would be a redistribution of vehicle emissions associated with redistribution of the traffic on surface roads. For much of the community this would result in no change or a small improvement (ie decreased concentrations and health impacts), however for some areas located near key surface roads, a small increase in pollutant concentration may occur.

Potential health impacts associated with changes in air quality (specifically NO_2 and particulate matter) within the local community have been assessed and are considered to be acceptable in relation to the applicable standards.

C11.8 Construction - impacts on health from other changes

14 submitters raised concerns that construction of the project would have impacts on the health of the community. These impacts are discussed in section 11.6 and Appendix K (Technical working paper Human health risk assessment) of the EIS.

C11.8.1 Construction impacts on health – changes in community

Submitters raised concerns that the introduction of a busy motorway would create a divide in the residential communities, hindering social contact and community cohesion, thereby affecting people's quality of life. Specific concerns included:

- Construction causing disruptions to the local community and impacting quality of life for many years to come
- Changes to everyday routine of children elderly and those with disabilities as they are sensitive to change.

Response

Any temporary changes to access to social infrastructure, community resources or to other desirable locations (such as employment, care facilities, school, friends and family) and safety to movement may affect community networks and in turn trigger community severance.

Community severance effects often occur during major transportation projects due to detours in the local road network, changes to active and public transport routes, connector roads receiving an increase or decrease in traffic movements and loss of open space. The changes to the road networks particularly along City West Link, Victoria Road, The Crescent, Lilyfield Road and Darley Road and loss of open space at King George Park and Buruwan Park, may contribute to feelings of community severance and disconnection. Feelings of isolation can affect quality of life and depending on the individual's adaptability to change and levels of resilience, the potential health effects can be varied.

Alternative active transport routes would be in place prior to any route disruptions caused by construction works, to maintain access and prevent community severance.

Management measures would be implemented to minimise impacts on pedestrian paths and cycle lanes, and provide timely alternatives and detours during construction where practical and safe to do so. Management measures are outlined in **Chapter E1** (Environmental management measures).

Once construction is completed, improvements to the active transport network, including improvements to transport connections, would have a positive benefit on community health. Where active transport opportunities are improved and offer safe alternatives to driving and public transport, they can encourage more active recreation and commuting activities.

C11.8.2 Construction social impacts on health – visual changes

Submitters were concerned that changes to the visual amenity of the area during construction would cause anxiety amongst community members.

Response

Visual amenity is an important part of an area's identity and offers a wide variety of benefits to the community in terms of quality of life, wellbeing and economic activity. For some individuals, changes in visual amenity can increase levels of stress and anxiety. However, these impacts are typically of short duration as most people adapt to changes in the visual landscape, particularly within an already urbanised area. As a result, changes in visual amenity are not expected to have a significant impact on the health of the community.

During construction, visual amenity in and around the project footprint has the potential to be affected by factors such as the removal of established vegetation, the installation of construction hoardings and/or the visual appearance of construction sites. Further factors may include the alteration of view corridors to heritage, open space, water bodies or the city skyline.

Assessment of the potential construction impacts on visual amenity is included in Chapter 13 (Urban design and visual amenity) of the EIS. As part of this assessment environmental management measures were developed to avoid, reduce and manage identified potential visual amenity impacts during construction. These include the following: developing ancillary facilities to minimise visual impacts for adjacent receivers where feasible and reasonable, designing site lighting to minimise glare issues and light spillage and establishment of hoarding to provide visual screening.

C11.9 Operation - air quality impacts on human health from ventilation facilities

1,629 submitters have raised issues arising from the ventilation facilities and potential human health risks. Air quality impacts on human health during operation of the project were assessed in section 11.5 section 11.5, Appendix K (Technical working paper: Human health risk assessment), Chapter 9 (Air quality) and Appendix I (Technical working paper: Air quality) of the EIS.

C11.9.1 Human health impacts from unfiltered ventilation facilities during operation

Submitters raised concern that emissions from unfiltered ventilation outlets would result in changes to air quality and affect the health and wellbeing of the community. Specific concerns and queries raised included air quality changes impacting human health through:

- Impacting sensitive groups including the elderly, pregnant woman, infants and young children, individuals with disabilities and those with pre-existing health problems (including asthma, chronic illnesses, respiratory disease)
- Exacerbating asthma, respiratory illness and causing more frequent illnesses such as cancers, cardiovascular disease, heart and lung disease and other life threatening medical conditions (including stroke) as well as shortening of life
- Increasing diesel fuel pollution
- Air filters must be added to the exhaust stacks to ensure the health of local residents and children is not compromised
- The reduction in additional health benefits that filtered ventilation outlets can provide.

Submitters raised concerns that the proposed locations of the ventilation outlets may further affect changes in air quality. This included the density and distribution of the ventilation outlets and their proximity to particular locations in the inner west. Specific concerns includes the potential health risk from having four unfiltered outlets in close proximity (at Rozelle, Haberfield and St Peters).

Response

The provision of a ventilation filtration system is not being proposed for the project. The assessment of the need for filtration (refer to section 10.3.2 of Appendix I (Technical working paper: Air quality) of the EIS), determined that there was no beneficial impact on air quality by implementing tunnel air filtration (refer to section 9.2.3 of the EIS). The health related reasons for this include:

- In-tunnel air pollutant levels, which are comparable to best practice and accepted elsewhere in Australia and throughout the world, would be achieved without filtration
- Emissions from the ventilation outlets of the M4-M5 Link tunnels would have a negligible impact on existing ambient pollutant concentrations.

This assessment concluded that filtration would not materially reduce annual $PM_{2.5}$ concentrations and therefore filtration would not result in detectable improvements or achieve the 'perceived' benefits in air quality for surrounding sensitive groups (refer to sections 9.2.3 and 10.3.2 of Appendix I (Technical working paper: Air quality) of the EIS). If outlet emissions were eliminated, the largest reduction in annual average $PM_{2.5}$ concentrations that people breathe would be 0.25 $\mu g/m^3$; with the reduction at most locations significantly less than this. A change in concentration of this magnitude would not be able to be reliably detected in ambient monitoring.

Very few tunnels around the world (new or under design) are equipped with air treatment systems and no tunnels in NSW are filtered. Incorporating filtration into the ventilation outlets would require a significant increase in the size of the tunnel facilities to accommodate the equipment. It would result in a larger project footprint, increase community impacts (through increased land acquisition and severance) and lead to higher capital cost. The energy usage would be substantial and does not represent a sustainable approach. A further discussion on the assessment of the need for filtration of outlets is provided in **section C9.11.1**.

Previous studies have shown that controlling pollutants at the source (ie vehicle emissions controls) is significantly more effective in improving local and regional air quality (ACTAQ 2014), National Health and Medical Research Council (NHMRC) 2008)). The NSW Government is committed to continuing to work with the Australian Government to implement cleaner fuels and cleaner vehicles, thereby reducing emissions at source. Total emissions from the Sydney vehicle fleet have reduced over the last 20 years, even with an increase in diesel vehicles, and are projected to continue to reduce into the future, thereby improving air quality and lowering associated health risks.

C11.9.2 Human health impacts from particulates emitted from the ventilation outlets

Submitters raised concern that ventilation outlets would result in health impacts from particulates. Specific concerns and queries raised included:

- There is no safe level of exposure to $PM_{2.5}$ or smaller particles. Particulate matter is linked with asthma, lung disease, cancer and stroke
- For every increase of five micrograms per cubic metre ($\mu g/m^3$) of $PM_{2.5}$ there is an increased risk of lung cancer by up to 18 per cent and mortality risk by seven per cent
- Impacts to health of local communities, due to $PM_{2.5}$ levels, specifically at Lilyfield, Annandale, Rozelle and Glebe
- The health risks associated with particulate air borne pollution are serious and well documented
- Particulate pollution causes or is linked with heart/cardiovascular disease, lung disease, cancer, asthma, stroke and shorter life span
- People living within 500 metres of heavily affected areas have shorter lives, higher instances of chronic lung conditions and cardiovascular disease (as concentrations of some pollutants such as $PM_{2.5}$ and PM_{10} are already near the current standard)
- Submitter raised health concerns with the emissions from the proposed ventilation facilities stating that motor vehicles account for 14 per cent of particulate pollution of 2.5 microns and less in Australia
- Reference to a statement made by the Head of Respiratory medicine at Royal Prince Alfred Hospital stating that heart disease will sky rocket due to air pollution caused by WestConnex bringing more cars into the inner west
- Those that are most at risk are the old, young and unborn babies
- Permitting an increase in fine particles does not fit with the duty of care placed upon the proponent to protect the health of local residents.

Response

The human health risk assessment presented in Appendix K examined the effect of air pollution changes on health outcomes including mortality and cardiovascular and respiratory morbidity. The health outcomes were drawn from national and internationally accepted health endpoints, as outlined in Table 6-22 of Appendix K (Technical working paper: Human health risk assessment) of the EIS. These endpoints have been derived from the most robust scientific literature. The assessment concluded that the air impacts were acceptable in relation to the applicable standards.

The project was assessed against the air quality criteria listed in the updated NSW Approved Methods (NSW EPA 2016). The updated NSW Approved Methods adopted the AAQ NEPM standards which were updated in 2016. The particle size addressed in the human health risk assessment relate to the particulates most commonly measured in urban environment air studies, including:

- PM_{10} (particulate matter below 10 micrometres in diameter)
- $PM_{2.5}$ (particulate matter below 2.5 micrometres in diameter).

The AAQ NEPM was amended in February 2016 with the main changes relating to particulates being as follows (National Environment Protection Council (NEPC) 2016):

- The advisory reporting standards for $PM_{2.5}$ were converted to formal standards
- A new annual average PM_{10} standard of 25 micrograms per cubic metre ($\mu g/m^3$) was established

- An aim to move to annual average and 24 hour $PM_{2.5}$ standards of seven $\mu g/m^3$ and 20 $\mu g/m^3$ by 2025 was included
- A nationally consistent approach to reporting population exposure to $PM_{2.5}$ was initiated
- The existing five-day allowed exceedance of the 24 hour $PM_{2.5}$ and PM_{10} standards was replaced with an exceptional event rule.

The maximum total and cumulative concentrations of $PM_{2.5}$ are above the guidelines for both a 24-hour average and an annual average (including the 2025 goal). This is due to the existing levels of $PM_{2.5}$ in the current urban environment. These elevated background levels would be present in the community regardless of the construction and operation of the project. Concentrations of total $PM_{2.5}$, however, are essentially unchanged within the local community with the operation of the project.

The air quality impact assessment in the EIS determined that PM_{10} emissions from the project ventilation outlets, even in the regulatory worst case scenarios, would not result in measurable impacts on local air quality including on residential receptors and sensitive community receptors such as child care centres, open space and playgrounds (refer to section 9.7 of the EIS). For $PM_{10,}$ the maximum contribution of the ventilation outlets under the worst case scenarios would be small. For both the annual mean and maximum 24 hour metrics the outlet contributions were less than 10 per cent of the respective criteria. No exceedances of the criteria due to the ventilation outlets alone would be likely.

Section 11.1.3 of the EIS describes the process for identifying sensitive receptors. Sensitive people in the local community include infants and young children, the elderly or those with existing health conditions or illnesses. The sensitive community receptors are locations where sensitive people may spend significant periods of time, hospitals, child care facilities, schools and aged care homes/facilities. The exposure response relationships for $PM_{2.5}$ mortality used in the human health risk assessment are for all ages – including children and the elderly.

Potential health impacts associated with changes in air quality from particulates from the project within the local community have been assessed and are considered to be acceptable in relation to the applicable standards.

Further details relating to elevated receptors are discussed in **section C9.11.2**.

C11.9.3 Human health impacts from the ventilation facilities

Submitters raised concerns that emissions from ventilation outlets would result in changes to air quality and affect the health and wellbeing of the community. Specific concerns and queries raised included air quality changes impacting human health through:

- Impacting sensitive groups including the elderly, pregnant woman, infants and young children, individuals with disabilities and exacerbating individuals with pre-existing health problems (including asthma, chronic illnesses, respiratory disease)
- Exacerbating asthma, respiratory illness and causing more frequent illnesses such as cancers, cardiovascular disease, heart and lung disease and other life threatening medical conditions (including stroke and shortening of life)
- Increasing air pollutants such CO, NO_2, benzene, sulphides, lead and particulate matter ($PM_{2.5}$ and PM_{10}).

Submitters raised concerns the proposed locations of the ventilation outlets may further affect changes in air quality. This included the density and distribution of the ventilation outlets and their proximity to the following locations in the inner west including:

- Areas such as Lilyfield, Annandale, Rozelle, Glebe, St Peters
- Schools and day care centres such as Rozelle Public School
- Parks, recreational areas, public spaces.

Submissions noted that the location of the ventilation outlets within a topographical low point (Rozelle Rail Yards), with surrounding residential suburbs at higher elevations, may further exacerbate changes in air quality and consequently, heath impacts.

Response

Sensitive receivers

The human health risk assessment in (Appendix K (Technical working paper: Human health risk assessment) of the EIS) examined the effect of air pollution changes on health outcomes including mortality, and cardiovascular and respiratory morbidity. It concluded that the impacts were acceptable in relation to the applicable standards.

Section 11.1.1 of the EIS and **section C11.9.2** define sensitive receivers, which includes the elderly, children and sensitive community receptors. Sensitive receptors include Rozelle Public School.

Table 4-1 and Figure 4-2 of Appendix K (Technical working paper: Human health risk assessment) of the EIS show the 40 community receptors included in the assessment. The list relates to receptors considered in the assessment of air quality impacts, for which a detailed quantitative assessment of health impacts has been undertaken in addition to the modelling undertaken for the remainder of the receptor locations. This list is representative only and is not intended to comprise an exhaustive list of community receptors in the study area. In addition to these community receptors, about 86,375 individual residential, workplace and recreational receptors (also shown in Figure 4-2), have been modelled in the streets/suburbs located in the study area. All these individual receptor locations (including the 40 community receptors) have been considered; therefore sensitive receptors are represented across the study area.

The air quality assessment provides emission profiles for each ventilation outlet (refer to section I.1.3 of Annexure I of Appendix I (Technical working paper: Air quality) of the EIS. Detailed contour plots which map the predicted dispersion of airborne emissions from the ventilation outlets are provided in Annexure K of Appendix I (Technical working paper: Air quality) of the EIS. The contour plots show annual mean and maximum 24 hour mean emissions of NO_X, PM_{10} and $PM_{2.5}$ for the assessment year 2023 and 2033 for each outlet.

Consistent with other approved tunnel projects such as NorthConnex, it is expected the project will be required to carry out air monitoring around the locations for ventilation outlets including on sensitive receptors, both before and during operation to monitor compliance with air quality standards.

Elevated receptors

The topography around the ventilation outlets formed part of the dispersion model (refer to Chapter 9 (Air quality) of the EIS). An assessment was undertaken to determine the air quality impacts of the project on elevated receptors. The air quality assessment modelled pollution dispersion taking into account local terrain and topography, including the presence of buildings in urban areas. The calculation of elevation considered the height of buildings and terrain (refer to section 9.7.5 of the EIS). The terrain within the project footprint varies from an elevation of around 10 metres Australian Height Datum (AHD) at the western end at Haberfield to an elevation of around 14 metres AHD at the Rozelle interchange and around 10 metres at St Peters, at the southern end of the project footprint.

Concentrations at two elevated receptor heights (10 metres and 30 metres) were considered for annual mean and 24 hour $PM_{2.5}$. For the 10 metre and 30 metre outputs, it was not necessarily the case that there were existing buildings at these heights at sensitive receptor locations.

The intent of the elevated receptor analysis was twofold:

- To determine potential adverse air quality impacts on existing elevated receptors
- To identify if there are potential constraints that should be taken into account for potential future residential developments, and which should be addressed through planning controls.

The ventilation outlets were predicted to not result in adverse air quality impacts at any existing elevated receptors as there are no existing buildings 30 metres or higher located close to the proposed ventilation facilities.

The implications of the results of the assessment of elevated receptors can be summarised as follows:

- For all receptor locations, the changes in $PM_{2.5}$ concentration at 10 metres are acceptable
- Future developments to the height of 10 metres should be possible at all locations in the area assessed. This assumes that the changes in $PM_{2.5}$ concentration for heights between ground level and 10 metres are also acceptable.

Additional issues relating to elevated receptors specific to a ventilation facility is discussed below where relevant.

Parramatta Road ventilation facility

The Parramatta Road ventilation facility at Haberfield is being built as part of the M4 East project, but would be fitted out and used by the M4-M5 Link project.

The air quality impact assessment determined that emissions from the project ventilation outlet at the Parramatta Road ventilation facility, even in the regulatory worst case scenarios, would not result in adverse impacts on local air quality. The ventilation outlet was predicted not to result in adverse air quality impacts at any existing receptors including schools, child care centres, open space and residential receptors. Emissions from the project's ventilation outlet, even in the regulatory worst case scenarios, would be unlikely to result in significant impacts on local ambient air quality.

Rozelle ventilation facility

The air quality impact assessment determined that emissions from the project ventilation outlets at Rozelle, even in the regulatory worst case scenarios, would not result in adverse impacts on local air quality. Meteorological information such as wind direction, wind speed, calms/low wind speed conditions, and temperature inversions, was used to model the peak concentration of air pollutants that may occur. The ventilation outlets were predicted to not result in adverse air quality impacts at any existing receptors such as schools, child care centres, open space and residential receptors.

Iron Cove Link ventilation facility

The air quality impact assessment determined that emissions from the project ventilation outlet near Iron Cove, even in the regulatory worst case scenarios, would not result in adverse impacts on local air quality. The ventilation outlet was predicted not to result in adverse air quality impacts at any existing receptors such as Rozelle Public School, child care centres, open space or residential receptors.

Campbell Road ventilation facility

The Campbell Road ventilation outlets contribution to concentrations of $PM_{2.5}$ and PM_{10} has been modelled as being very small. Review of the changes in particulate matter concentrations predicted in 2023 and 2033 for the M4-M5 Link project indicated that for a number of receptors in the local community the project results in a decrease in the concentration of $PM_{2.5}$ and PM_{10} (at ground level). For a number of receptors there is an increase in the concentration of $PM_{2.5}$ and PM_{10}, which relates to the redistribution of emissions on surface roads in the study area, not from emissions from the ventilation facilities (as discussed in Appendix I (Technical working paper: Air quality) of the EIS).

The results of the assessment in relation to potential health impacts at both 10 metres and 30 metres above the ground level, indicated that at a height of 10 metres within the study area, the maximum change in $PM_{2.5}$ is lower than at ground level and results in risks that are considered to range from negligible to tolerable/acceptable in relation to the applicable standards.

The assessment identified that $PM_{2.5}$ concentrations are higher at 30 metres above the ground than at ground level or at 10 metres height in some locations close to the Campbell Road ventilation outlets. The risks to health in these locations are greater than the acceptable limits. Currently there are no buildings above 10 metres in height located in the vicinity of the Campbell Road ventilation outlets and so the potential impacts calculated are hypothetical at this stage.

The future development of land (including rezoning) that may involve multi-storey residential buildings above 10 metres high in the vicinity of the St Peters interchange ventilation facilities (associated with the New M5 and M4-M5 Link projects) would need to consider the dispersion performance of the ventilation facilities. Planning controls should be developed in the vicinity of St Peters to ensure future developments at heights 10 metres or higher are not adversely impacted by the ventilation outlets.

C11.10 Operation - air quality impacts on human health within the tunnels

Seven submitters have raised issues regarding the in-tunnel health impacts. Air quality impacts on human health during operation of the project were assessed in section 11.5, Appendix K (Technical working paper: Human health risk assessment), Chapter 9 (Air quality) and Appendix I (Technical working paper: Air quality) of the EIS.

C11.10.1 Impacts on human health from in-tunnel air pollution

Submitters raised concern about the impact on the health of tunnel users from air pollution. Specific concerns raised are:

- The health impacts associated with inhaling fumes during congestion in the tunnel
- Will the ventilation system remove NO_X and CO to safe levels within the tunnels.

Response

In February 2016, the ACTAQ issued a document entitled *In-tunnel Air Quality (Nitrogen Dioxide) Policy* (ACTAQ 2016). The policy wording requires tunnels to be '*designed and operated so that the tunnel average nitrogen dioxide (NO_2) concentration is less than 0.5 ppm as a rolling 15-minute average'*. This criterion compares favourably to the international in-tunnel guidelines which range between 0.4 and 1.0 parts per million (ppm). The in-tunnel air quality assessment is outlined in section 9.7.1 of the EIS. The three pollutants assessed for in-tunnel air quality were NO_2, CO and visibility.

While concentrations of pollutants from vehicle emissions are higher within the tunnel (compared with outside the tunnel), and with the completion of a number of tunnel projects (approved or proposed), there is the potential for exposures to occur within a network of tunnels over varying periods of time, depending on the journey. The tunnel ventilation system would be designed and operated so that the in-tunnel air quality limits, consistent with those in the conditions of approval for NorthConnex and the approved WestConnex component projects, are not exceeded for any journey through the M4-M5 Link and adjoining tunnels, no matter how long the journey.

The assessment of potential exposures inside these tunnels indicated:

- Where windows are up and ventilation is on recirculation, exposure to NO_2 inside vehicles is expected to be well below the current health based guidelines. In congested conditions inside the tunnels, it is not considered likely that significant adverse health effects would occur. Keeping windows closed and switching ventilation to recirculation has been shown to reduce exposures to particulates inside the vehicle by up to 80 per cent and by up to 75 percent for CO and NO_2 (NSW Health 2003) . While no guidelines are available for very short duration exposures, this action would further reduce exposure to motorists
- For motorcyclists, where there is no opportunity to minimise exposures through the use of in-vehicle ventilation, there is the potential for higher levels of exposure to NO_2 and particulate matter. These exposures, under normal conditions, are not expected to result in adverse health effects. When the tunnels are congested it is expected that motorcyclists would spend less time in the tunnels than passenger vehicles and trucks, limiting the duration of exposure and the potential for adverse health effects
- For individuals who regularly use tunnels for commuting or as part of their employment, there is the potential for repeated exposures to higher levels of NO_2 and particulates during the day. While these exposures are not likely to be additive in terms of potential health effects, it is important that these road users utilise vehicle ventilation on recirculation whenever they are using the tunnels
- Where advice is provided to place ventilation on recirculation when using the tunnel or the network of tunnels, it is not expected to result in carbon dioxide levels inside the vehicle that may adversely affect driver safety. However, where Roads and Maritime provides specific advice to drivers entering road tunnels to put ventilation on recirculation, further advice would be provided to motorists that recirculation should be switched off at some point after using the tunnel network and not left on for an extended period of time to avoid any build-up of carbon dioxide in the vehicle cabin.

The findings made by the ACTAQ on the air quality assessment and ventilation report (Annexure I of Appendix I (Technical working paper: Air quality) of the EIS) are:

'We are satisfied that the EIS has comprehensively addressed the issue of cumulative exposure arising from journeys through multiple consecutive tunnels made possible by the M4-M5 Link'. (See responses in **section B3.2.5**).

C11.11 Operation - air quality impacts on human health from surface roads

1,489 submitters have raised issues regarding impacts to health from changes to air quality from surface traffic. Air quality impacts on human health during operation of the project were assessed in section 11.5 and Appendix I (Technical working paper: Air quality) of the EIS.

C11.11.1 Increased traffic resulting in air pollution and impacts on human health during operation

Submitters raised concerns regarding increased traffic during operation of the project and the impacts of resultant pollution at surface level on the health of residents in the region.

Specific health concerns include changes to air quality impacting human health through:

- Impacting sensitive groups including the elderly, pregnant woman, infants and young children, individuals with disabilities and those with pre-existing health problems (including asthma, chronic illnesses and respiratory disease)
- Exacerbating allergies, asthma, respiratory illness and causing more frequent illnesses such as colds, skin conditions, gastrointestinal issues, cardiovascular disease, cancers and heart disease or other life threatening illnesses
- Disturbing children's development, sleep, mental health and causing fatigue, stress and night terrors and higher rates of low birth weight in babies
- Increasing road traffic contaminants (CO, NO2, volatile organic compounds, particulates) or potential carcinogens (diesel fumes, PM2.5 and PM10).

Submitters raised concerns for human health from air quality changes around the following locations:

- St Peters interchange and Rozelle interchange
- Roads including the Princes Highway, King Street, Edgeware Road, McEvoy Street, Enmore Road, The Crescent, Booth Street, Wattle Street, Parramatta Road, Victoria Road and the intersection of Alison Road and Anzac Parade
- Annandale, Drummoyne, Rozelle, St Peters, Haberfield and Ashfield and near the Sydney Fish Market
- Annandale North Public School, Annandale Public School, Erskineville Public School, Leichhardt Public School and Newtown Public School
- Within 50 metres of roads with special reference to Euston Park, Sydney Park, Mitchell and Erskineville Roads
- People living within 500 metres of heavily affected areas having shorter lives higher instances of chronic lung conditions and cardiovascular disease (as the concentration of some pollutants including $PM_{2.5}$ and PM_{10} is already near the current standard)
- Newly proposed sports grounds or active transport infrastructure adjacent or near roadways
- The project being within the Sydney basin where air pollution from traffic emissions may accumulate
- Pedestrians and cyclist arising from exposure to vehicle emissions while crossing Anzac Bridge.

Submitters raised concerns that traffic congestion on surface roads would impact on sensitive receptors (including but not limited to nearby local schools and residents). The following specific concerns were raised for human health:

- Residents around the tunnels exposed to changes in air quality from traffic congestion as vehicles enter and exit the tunnels
- Residents in areas where streets are narrow, grid locked or already subject to traffic congestion including Erskineville, King Street and at Alexandria
- Local surface roads will be upgraded thereby increasing the volume of traffic.

Response

As the majority of the project alignment would be underground, the operation of the project is predicted to result in a decrease in total pollutant levels in the community. There would be a redistribution of vehicle emissions associated with redistribution of the traffic into the M4-M5 Link tunnels from surface roads. The project is also improving pedestrian and cyclist facilities through the study area. This includes a shared path through the open space at the Rozelle Rail Yards connecting to a new underpass below Victoria Road. This link would connect with the existing shared path located to the north of Victoria Road towards Anzac Bridge and reduce the amount of time that active transport users are adjacent to roads with heavy traffic flows.

Section 11.1.1 of the EIS and **section C11.9.2** define sensitive receptors. The study area of the human health risk assessment is outlined in section 11.1.2 of the EIS and includes the suburbs of Ashfield, Haberfield, Leichhardt, Lilyfield, Rozelle, Annandale, Stanmore, Camperdown, Newtown and St Peters. The risk assessment considered health issues that are short-term (acute) and long-term (chronic) impacts during construction and operation of the project. Issues such as asthma, eczema, cancers and cardiovascular diseases along with health conditions which may result from stress and anxiety were considered in the assessment. Further discussion relating to stress and anxiety is provided in **section C11.16**.

For much of the community, including schools, this would result in no change or a small improvement (ie decreased concentrations of pollutants and health impacts), however for some areas located near key surface roads, a small increase in pollutant concentration may occur.

The air quality assessment provides detailed contour plots which map the predicted dispersion modelling for the expected traffic scenarios. The modelled scenarios include existing levels of traffic congestion. The contour plots show the change in air pollutants as a result of the project for annual mean and maximum 24 hour mean emission of NO_X, PM_{10} and $PM_{2.5}$ for 2023 and 2033. These figures are shown in section 9.7.3 of the EIS. Terrain effects, such as elevated or low lying areas, are taken into account in the dispersion model using terrain data sourced from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) website.

Potential health impacts associated with changes in air quality for VOCs, CO, NO_2 and particulates within the local community are discussed further below.

Volatile organic compounds and polycyclic aromatic hydrocarbons

The project results in a lower total impact of VOCs and PAHs in the community. The change in VOC and PAH concentrations associated with the project is a decrease for most receptors, however in some areas there is a small increase in concentrations associated with the redistribution of emissions from vehicles, primarily associated with surface roads (refer to section 6.6.4 of Appendix K (Technical working paper: Human health risk assessment) of the EIS). Additional traffic and therefore an increase in pollutant concentrations are predicted at the following locations:

- To the north of Iron Cove Link and near Anzac Bridge as a result of the general increase in traffic due to the project
- Canal Road, which would be used to access the St Peters interchange.

The assessment of acute exposures to VOCs found that there are no acute risk issues in the local community associated with the project. The assessment of chronic exposures to VOCs and PAHs also found that there are not considered to be any issues of chronic health risk in the local community associated with the operation of project.

Carbon monoxide

Motor vehicles are the dominant source of CO in air (DECCW 2009). Adverse health effects of exposure to CO are linked with carboxyhaemoglobin in blood and associated cardiovascular issues especially in the elderly (refer to section 11.51 of Appendix K (Technical working paper: Human health risk assessment) of the EIS). Guidelines are available in Australia from NEPC (2003) and NSW EPA that are based on the protection of adverse health effects associated with CO.

All the concentrations of CO with and without the project and for cumulative scenarios are well below the relevant health based guidelines. On this basis, it is considered that there would be no adverse health effects in relation to exposures (acute and chronic) to CO in the local area surrounding the project.

Nitrogen dioxide

In Sydney, it was estimated that on-road vehicles account for about 62 per cent of emissions of NO_X (NSW EPA 2012).

NO_2 is the only oxide of nitrogen that may be of concern to health (WHO 2000). NO_2 can affect the respiratory system and increase susceptibility to respiratory infection. Asthmatics, the elderly and people with existing cardiovascular and respiratory disease are particularly susceptible to the effects of NO_2. Guidelines are available from the NSW EPA and NEPC (NEPC 2003) which indicate acceptable concentrations of NO_2.

All the concentrations of NO_2 predicted for the project are below the chronic NEPC guideline of 62 $\mu g/m^3$. The ambient air quality for surface road users, including cyclists who are unable to use the tunnel and motorists who choose to use the surface roads, will experience a concentration of nitrogen dioxide below 32 $\mu g/m^3$ which is well below the NSW impact assessment criterion of 62 $\mu g/m^3$, as discussed in section 9.7.3 of the EIS. Therefore, no adverse health effects are expected in relation to chronic exposures to NO_2 in the local area surrounding the project.

As assessment of total concentrations of NO_2 cannot be used to determine acute exposure because there is no clear threshold established for community exposures to NO_2, therefore an assessment of incremental exposures was of most relevance to the risk assessment. Calculated changes in incidence of health effects in the population associated with changes in NO_2 concentrations for both 2023 and 2033 was negative, meaning a decrease in incidence of health effects is predicted as a result of the project. Most local government areas (LGAs) show a total decrease in health incidence. There are a few local government areas where there is an increase predicted. These increases and decreases are very small. As a result, these changes are unlikely to be measurable in the community.

Particulates

The maximum total/cumulative concentrations of $PM_{2.5}$ are above the NSW EPA criteria for both a 24 hour average and an annual average. This is due to the existing levels of $PM_{2.5}$ in air within the current urban environment. These elevated background levels would be present in the community regardless of the construction and operation of the project. Concentrations of total $PM_{2.5}$, however, are essentially unchanged within the local community with the operation of the project.

The maximum concentrations of PM_{10} in residential and commercial/industrial (workplace) areas are below the annual average guideline. Concentrations of total PM_{10} are essentially unchanged within the local community with the operation of the project.

The total change in the number of health related cases, for both 2023 and 2033 is negative; meaning a decrease in incidence as a result of the project was predicted. However, the number of cases is very small, being less than one for all health effects considered. As a result, these changes would not be measurable within the community.

The change in health related incidence calculated for individual suburbs for $PM_{2.5}$ indicate that predicted changes to these populations predominantly relate to small decreases in health incidence. Some suburbs showed an increase, but the incidence for an individual suburb is less than 0.1 cases. Hence there was no individual suburb within the study area where there is an incidence change that is of significance or would be measurable. All calculations relevant to the LGAs, including calculation for each individual suburb considered in the LGAs, are presented in Annexure G of Appendix K and listed in **Table C11-4.** The detailed breakdown of the health endpoint, age group and indicators was provided in Annexure G of Appendix K (Technical working paper: Human health risk assessment) of the EIS).

Table C11-4 Suburbs with predicted increased incidence - $PM_{2.5}$

Project assessment year	Local government area	Suburb
2023 'With' project'	Canada Bay	Concord - Mortlake - Cabarita Concord West
	Strathfield	Homebush Bay
	Sydney	Pyrmont North Sydney Sydney
	Botany	Botany Mascot Pagewood
	Georges River	Oatley
2023 'Cumulative'	Canada Bay	Concord - Mortlake - Cabarita Gladesville Concord West Drummoyne - Rodd Point Hunters Hill
	Strathfield	Homebush Bay
	Sydney Inner West	Balmain Sydenham
	Sydney	Pyrmont North Sydney
2033 'With project'	Canada Bay	Concord - Mortlake - Cabarita Concord West
	Strathfield	Homebush Bay
	Sydney Inner West	Balmain Sydenham
	Sydney	Pyrmont Crows Nest North Sydney Waterloo
	Botany	Botany Mascot Pagewood
2033 'Cumulative'	Canada Bay	Concord - Mortlake - Cabarita Gladesville Concord West Hunters Hill Drummoyne - Rodd Point
	Strathfield	Homebush Homebush Bay
	Sydney Inner West	Balmain

Project assessment year	Local government area	Suburb
	Sydney	Pyrmont Crows Nest Surry Hills North Sydney Sydney
	Botany	Botany
	Rockdale	Monterey
	Georges River	Kogarah Kogarah Bay

C11.11.2 Human health impacts as a result of changes to air quality at the portals

Submitters raised concerns that traffic entering and exiting the portals would impact on local air quality. The following specific concerns were raised:

- Residents living near the tunnel portals are exposed to additional emissions
- Motorists entering or exiting the tunnel portals exposed to emissions with their windows open.

Response

A key operating restriction for tunnels in Sydney is the requirement for there to be no emissions of air pollutants from the portals. To avoid portal emissions, the design would ensure that polluted air would be expelled from one or more elevated ventilation outlets along its length. The air from exit ramps is pushed back to the ventilation outlets by tunnel fans to prevent emissions from the portals or pollutants accumulating at the portal locations.

Entry and exit ramps would vary in size and shape in response to local conditions, but all are designed to minimise gradient changes and congestion at the portals both when vehicles are entering and exiting the tunnels, thereby minimising emissions collecting near tunnel ramps.

Much of the community, including residences, community facilities and areas of open space, would experience no change or a small improvement in air quality as a result of the project through a reduction in surface road traffic, design of the exit/entrance ramps and management of traffic. This would minimise health risks associated with emissions around the project portal locations.

Velocity monitors will be placed in each tunnel ventilation section and at portal entry and exit points. The velocity monitors in combination with air quality monitors will be used to modulate the ventilation within the tunnel to manage air quality and to ensure air inflow at all tunnel portals (see **Chapter E1** (Environmental management measures)).

C11.12 Operation - noise and vibration impacts on human health

71 submitters have raised issues regarding noise and vibration impacts to human health during operation of the project. The EIS assessed the human health impacts of operation noise and vibration in section 11.5. Further detail on the noise and vibration assessment is provided in Chapter 10 (Noise and vibration) and Appendix J (Technical working paper: Noise and vibration) of the EIS.

C11.12.1 Noise and vibration impacts to health during operation

Submitters raised concern that noise impacts to residents during operation of the project can impact health. Specific issues raised were as follows:

- Traffic noise causing annoyance, sleep disturbance and sleep deprivation. The health concerns associated with these include stress, high blood pressure, cardiac arrhythmia, heart attacks and tinnitus. Other concerns include lack of sleep leading to poor mental health and night terrors

- Traffic noise impacting the community's health at the St Peters interchange and other areas near the tunnels.

Response

Potential operational noise impacts have been assessed against NSW criteria that have been established on the basis of the relationship between noise and health impacts. The criteria developed for use in the assessment for control of noise come from policy documents developed by the NSW Government and regulated by the NSW EPA, including the NSW INP, the ICNG, and the NSW RNP. All of these policies are based on the annoyance effects of noise, which may result in health impacts when exposed to unacceptable levels repeatedly over an extended length of time.

Section 11.5.2 of the EIS discusses the short-term and long-term adverse effects on people which may result from noise and vibration impacts and are considered within the health risk assessment. These include sleep disturbance, annoyance, hearing impairment, interference with speech and other daily activities, children's school performance, and cardiovascular health. Other health impacts, but for which the evidence is weaker, have also been considered in the human health risk assessment. These include effects on mental health, tinnitus (which can also result in depression, communication and listening problems and a restricted participation in social life), cognitive impairment in children and indirect effects such as impacts on the immune system.

The assessment of potential health impacts relating to operational noise focused on whether the guidelines/criteria that have been established can be met. The NSW noise policy and guidelines against which this project is assessed are designed to protect the most sensitive receivers from annoyance and sleep disturbance. Where the guidelines cannot be met there is the potential to interfere with communication, disturb sleep and cause annoyance. Further, communities subjected to long-term exposure of acute noise levels may experience impairment of cardiovascular health and reduced cognitive performance in children.

For over 60 per cent of the receivers evaluated, noise levels would be reduced as a consequence of the project, resulting in associated health benefits. However, the worst case assessment also predicts that noise criteria and vibration criteria would be exceeded at a number of properties adjacent to the project during construction and operation without mitigation measures (refer to section 11.5.2 of the EIS).

The worst case levels of road traffic noise estimated are sufficiently high for some receivers that health impacts are likely to occur if left unmitigated. These properties are located south of Victoria Road adjacent to the Iron Cove Link tunnel portals; and to the west of Victoria Road near Lilyfield Road. These are primarily related to the new road alignment being closer to residential homes, and the removal of buildings closest to the road (that previously was a barrier to noise from the roadway). A number of properties have also been identified where cumulative noise impacts exceed the relevant guidelines.

An exceedance of 12 dBA from fixed facilities is predicted at one receiver directly adjacent to the substation at the Iron Cove Link motorway operations complex. Three other receivers exceed the criteria by no more than 5 dBA. The 12 dBA exceedance of the fixed facilities noise criteria in the Iron Cove area is dominated by the substation located adjacent to Callan Street. Noise mitigation will be considered in the design of the substation during the detailed design stage where specific equipment would be selected. The mitigation would be designed to minimise noise emissions to comply with the applicable noise criteria. External noise levels (from fixed facilities) at the Rozelle Public School would be less than 35 dBA L_{Aeq}.

Mitigation measures aim to minimise noise impacts at source to reduce instances of annoyance, sleep disturbance and other effects to prevent this leading to long term exposure and thereby minimising potential health impacts. Further discussion relating to management of noise impacts is provided in **section C10.13**. Noise mitigation for both at-source and at-property for both road traffic and fixed facility noise sources are to be further investigated and confirmed during detailed design. Where specific residents/properties do not take up the proposed at-property treatments to mitigate noise indoors, there is the potential for noise levels at these properties to exceed the relevant guidelines/criteria. In these situations there is the potential for adverse health effects, particularly annoyance and sleep disturbance, to occur.

The calculation of impacts on the City of Sydney LGA, of which St Peters is a part, is presented in Annexure E and G of Appendix K (Technical working paper: Human health risk assessment) of the EIS. The human health risk assessment identifies the highest predicted impacts on the community with the understanding that the impact on the surrounding communities will be less. Based on the highest impacts, the health risk assessment concluded the impacts to the City of Sydney LGA to be acceptable in relation to the applicable standards. Additional reporting relating to the St Peter's area which may arise from the New M5 project around the St Peters interchange are assessed in the EIS (Roads and Maritime 2016) for that project.

C11.13 Operation - public safety impacts on human health

99 submitters have raised issues regarding impacts to public safety during operation. Impacts on human health during operation of the project were assessed in section 11.6 and Appendix K (Technical working paper: Human health risk assessment) of the EIS.

C11.13.1 Public safety impacts as a result of the project

Submitters raised concerns about electromagnetic fields on the health and wellbeing of the local community. Specific concerns were:

- Health impacts from the electrical substation located under residential properties at Haberfield
- The close proximity of the Iron Cove Link ventilation facility to residents on Callan Street will increase the potential of health impacts due to exposure to electromagnetic fields.

Response

The detailed design of the project would ensure that the exposure limits for the general public in the Draft Radiation Standard – Exposure Limits for Magnetic Fields (Australian Radiation Protection and Nuclear Safety Agency, December 2006) would not be exceeded at the boundary of sites. This consideration specifically relates to substations.

Ventilation facilities would have lower electromagnetic fields than substations but would also meet the requirements of this standard. The risk to public health is therefore considered to be low (refer to section 11.5.3 of the EIS).

C11.13.2 Public safety impacts to health from water treatment facilities

Submitters commented on their concern for public safety due to the water treatment facilities. This included concern with health impacts from:

- Risks associated with the water treatment facilities
- Treated water being discharged into the stormwater drain at Blackmore Park and the potential health impacts for users of the local rowing clubs and the users of the bay
- Risk from diseases transferred by a mosquito population associated with stagnant water at the Rozelle Rail Yards operational facilities.

Response

The operational water treatment facilities will be designed such that wastewater will be of suitable quality for discharge to the receiving environment. Discharge criteria will be developed in accordance with relevant guidelines that consider the environmental and recreational values of receiving waters and this will be included in the Operation Environmental Management Plan prepared for the project (see **Chapter E1** (Environmental management measures)).

A qualitative assessment of the risk posed by treated groundwater discharges to ambient water quality within Rozelle Bay and Hawthorne Canal (near Blackmore Park) determined the following:

- Considering the groundwater quality and proposed treatment, impacts on ambient water quality within Rozelle Bay are likely to be negligible
- Considering the groundwater quality and proposed treatment, impacts on ambient water quality within Hawthorne Canal are likely to be negligible and localised to near the outlet.

Water discharges from the project would not accumulate on site but would be treated and discharged. Treated flows from the Rozelle plant would drain via a constructed wetland to Rozelle Bay. The constructed wetland would receive and discharge water and would therefore not become stagnant.

Furthermore, groundwater modelling was carried out to assess the performance of the proposed water quality treatment measures against pollutant reduction targets. The modelling results for the main locations where water would be discharged indicate that the project would generally reduce the mean annual stormwater pollutant loads being discharged to the Sydney Harbour and the Parramatta River estuary, when compared to the existing conditions; and the project would generally reduce the mean annual stormwater pollutant loads being discharged to receiving waterways, when compared to the existing conditions. Meeting discharge requirements would prevent any potential health impacts arising from the treated discharge water from the project.

Further details relating to water quality is provided in **Chapter C15** (Soil and water quality).

C11.14 Operation - impacts on human health from changes to traffic and transport

Eight submitters have raised issues regarding changes to traffic and transport during operation of the proposal. Impacts on human health during operation of the project were assessed in section 11.6 and Appendix K (Technical working paper: Human health risk assessment) of the EIS.

C11.14.1 Changes to traffic and transport impacting on health of the community

Submitters raised concerns that changes to traffic, including encouraging private vehicle use would:

- Lead to increases in sedentary diseases such as obesity
- Discourage physical activity which is associated with diabetes, cancer and heart disease.

Response

Once the project is complete, it is expected that reductions in vehicle delays in a number of areas would occur. Traffic congestion and long commuting times can contribute to increased levels of stress and fatigue, more aggressive behaviour and increased traffic and accident risks on residential and local roads as drivers try to avoid congested areas (Hansson et al. 2011). Increased travel times reduce the available time to spend on healthy behaviours such as exercise, or engage in social interactions with family and friends. Long commute times are also associated with sleep disturbance, low self-rated health and absence from work (Hansson et al. 2011). Reducing travel times and road congestion is expected to reduce these health impacts.

Upgraded and additional facilities for pedestrians and cyclists would be provided as part of the project including the delivery of active transport links around permanent operational infrastructure. This would include two new bridges over City West Link connecting the communities of Rozelle, Balmain, Lilyfield, Glebe and Annandale, and an upgraded east-west connection between Lilyfield Road, the Rozelle Rail Yards, The Bays Precinct and Anzac Bridge. Improvements in the active transport network, including improvements in transport connections, would have a positive benefit on community health. Where active transport opportunities are improved and offer safe alternatives to driving and public transport, they can encourage more active recreation and commuting activities.

In addition, the project has committed to delivering up to 10 hectares of open space at the Rozelle Rail Yards. This could include provision of community and social infrastructure such as sporting fields and other active recreational facilities, and would be determined through consultation with relevant stakeholders and the community. These additional or improved open space areas would provide local communities with increased opportunity for active recreational activities and increased open space, potentially improving health and opportunities for social interaction and cohesion.

C11.15 Operation - impacts on human health from other changes

Four submitters have raised issues regarding social impacts on health during operation which have not been addressed in the preceding sections. Impacts on human health during operation of the project were assessed in section 11.6 and Appendix K (Technical working paper: Human health risk assessment) of the EIS.

C11.15.1 Operation social impacts on health – equity

Submitters noted that certain members of the community would be more susceptible to health effects associated with impacts related to the project. In particular, groups which would be more sensitive to the impacts include the elderly, individuals with pre-existing health problems, infants and young children, individuals with disabilities and individuals living in areas of higher levels of air and/or noise pollution.

Response

To further evaluate potential equity issues associated with the project, the location of impacts identified in relation to air quality, noise and traffic were reviewed individually and in combination, in conjunction with available information on the location of sensitive community groups (refer to section 11.6.6 of the EIS.

In many urban areas housing prices are generally lower along main roadways. The median house prices in the study area are variable; however, in most areas they are consistent with the Sydney average. Some public housing is located in the study area; however, these properties are mixed in with privately owned property such that there are no specific areas with higher populations of public housing tenants. No social equity issues have therefore been identified in relation to the change in air quality in the local community.

There are no areas identified in the local community where the combined impact from changes in noise and air quality would be different from the conclusions presented for the EIS assessment of air quality and noise impacts.

A number of existing industrial premises located in the area to the north and northwest of Sydney Airport, between Airport Drive/Alexandra Canal and the Princes Highway, would experience the greatest increase in particulates and NO_2, as a result of the project. These areas are industrial, where the incremental risks are considered to be acceptable/tolerable in relation to the applicable standards. There are no community facilities (including child care or aged care facilities) located in these areas, and it is not expected that the area would be rezoned in the future for residential or community use given the proximity to Sydney Airport (including flight paths).

Suburbs in the study area that, based on the 2011 Census data, are slightly more disadvantaged (in relation to the Socio-Economic Index for Areas (SEIFA)) include Glebe, Eveleigh and Marrickville, as well as populations in the Canterbury area. There are no project related air quality or noise impacts (including during 'Cumulative' scenarios) that are of significance in these areas. Impacts on human health in these areas would be lower than predicted for the maximum impacted individuals.

Residents and community facilities located adjacent to a number of key surface roads, particularly City West Link, Parramatta Road, the Princes Highway, parts of Victoria Road at Rozelle, Southern Cross Drive and the M5 Motorway corridor, would benefit from reduced traffic volumes, potentially improved traffic and pedestrian safety, and improvements (albeit small and not measurable) in air quality and noise.

In relation to broader equity aspects, the M4-M5 Link, along with other approved WestConnex component projects (M4 East and New M5), are aimed at improving access to the area from outer lying areas in the west and southwest. The SEIFA for populations in the outer west and southwest are lower, indicating they are more disadvantaged than populations in the study area. Improving access and travel times for these more disadvantaged populations provides the potential for health benefits such as those that are derived from improved employment opportunities, decreased travel times (and potentially more time available for other active, family or community activities) and reduced levels of stress and anxiety.

C11.15.2 Operation impacts on health – changes in community

Submitters raised concerns that the introduction of a busy motorway would create a divide in the residential communities and hinder social contact and community cohesion, which would impact quality of life.

Response

Once the project is complete, it is expected that reductions in vehicle delays in a number of areas would occur. Traffic congestion and long commuting times can contribute to increased levels of stress and fatigue, more aggressive behaviour and increased traffic and accident risks on residential and local roads as drivers try to avoid congested areas. A decrease in travel times can increase the available time to spend on heathy behaviours such as exercise, or engage in social interactions with family and friends. Long commute times are also associated with sleep disturbance, low self-rated health and absence from work. Reducing travel times and road congestion is expected to reduce these health impacts.

Social connectedness and relationships are important aspects of feeling safe and secure. Streets with heavy traffic are associated with fewer neighbourhood social support networks and have been linked to adverse health outcomes. The project would reduce surface traffic volumes, in particular heavy vehicles. In addition, where active transport opportunities are improved and offer safe alternatives to driving and public transport, they can encourage more active recreation and commuting activities.

Following completion of the construction works it is proposed that the Rozelle Rail Yards include open space such as a constructed wetland and additional pedestrian and cyclist infrastructure. This would provide improved open space away from busy roads which would give the community at Rozelle increased opportunities for active recreation, potentially improving health. This open space would also connect surrounding communities to Rozelle through the extension of open space between Bicentennial Park and Easton Park. Additional opportunities for open space would be created at Rozelle near the Iron Cove Link portals. The development of these areas of open space would be detailed through the UDLPs to be prepared for the project.

C11.16 Stress and anxiety

143 submitters have raised issues regarding anxiety. Impacts on human health relating to stress and anxiety during operation of the project were assessed in section 11.9 and Appendix K (Technical working paper: Human health risk assessment) of the EIS.

C11.16.1 Stress and anxiety impacts as a result of property acquisition

Submitters were concerned that the acquisition of property would cause stress and anxiety to members of the community whose properties would be acquired. Specific concerns relate to:

- Roads and Maritime previously indicated the intention to compulsorily acquire a property but this has not progressed, causing significant stress to families
- Stress and anxiety with regards to the potential acquisition of property including not being paid market value.

Response

The design of the project has been developed to minimise the need for surface property acquisition and impacts on other residential and open space areas. There would, however, be a number of property acquisitions as well as other temporary and permanent impacts on land use associated with the project.

The acquisition and relocation of households and businesses due to property acquisition can disrupt social networks and affect health and wellbeing due to raised levels of stress and anxiety. This includes increased levels of stress and anxiety during the process of negotiating compensation and relocation. In addition, a house and a workplace are central to daily routine with the location of these premises influencing how a person may travel to/from work or study, the social infrastructure and businesses they visit and the people they interact with.

Impacts associated with property acquisition will be managed through a property acquisition support service that will provide the following:

- Affected households would have access to a counselling service that assists people through the property acquisition process and, where necessary, provides referrals to more specialised experts
- An independent service is to be provided to vulnerable households (eg the elderly or those suffering an illness) to assist with relocation. Assistance could include, finding a suitable house for relocation (purchase or rent), arranging removalists, disconnecting services and attending appointments with solicitors or other representatives
- A community relations support toll-free telephone line will be established to respond to any community concerns or requests for translation services.

All acquisition required for the project would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW), the Land Acquisition Information Guide (NSW Government 2014) and the land acquisition reforms announced by the NSW Government in 2016 (NSW Government 2016), which can be viewed online[2]. Relocation and some other categories of expenses would be claimable under this Act.

C11.16.2 Stress and anxiety impacts from the project

Submitters were concerned that the project is causing stress and anxiety. Specific concerns relate to:

- Certain members of the community would be more susceptible to stress associated with the project. These include children, the elderly, pregnant woman and individuals with disabilities or pre-existing health conditions
- Stress and anxiety caused from construction including:
  - Noise, vibration, light and other construction activities
  - Construction activity at night causing sleep disturbance
  - Construction program delays causing mental stress
  - The uncertainty of construction location, timing and duration
  - Compensation if property damage occurs
  - The number of sites on and around the Rozelle - Iron Cove peninsula
- Stress and anxiety caused from operation of the project including:
  - Increased air pollution causing long term mental health issues
  - Ventilation facilities
  - Community and social change such as connectivity to other suburbs, affordability of housing, removal of public housing and desirability of an area to live, shop or own a business
- The community feeling stressed and disempowered by the EIS process and powerless to influence proposals.

Response

Section 11.9 of the EIS considers stress and anxiety issues which may lead to many adverse health problems including physical illness and mental, emotional and social problems. Increased urbanisation, regardless of specific projects, has been found to affect levels of stress and mental health (Srivastava 2009). These impacts are greater where there is urbanisation without improvements in infrastructure to improve equitable access to employment, social areas and communities (Srivastava 2009).

The role of either acute (short-term) or chronic (long-term) environmental stress on the health of any community, in general and for specific project(s), including the WestConnex projects, cannot be quantified. There are a wide range of complex factors that influence health and wellbeing, specifically mental health. It is not possible to determine any specific outcomes that may occur as a result of a specific project. However, within any urban environment there would be a wide range of stressors present from infrastructure projects, as well as other urban developments that may or may not contribute to the health effects outlined above.

[2] https://www.finance.nsw.gov.au/sites/default/files/NSW_Government_Response.pdf

Traffic congestion and long commuting times can contribute to increased levels of stress and fatigue, more aggressive behaviour and increased traffic and accident risks on roads as drivers try to avoid congested areas (Hansson et al. 2011). Increased travel times reduce the available time to spend on healthy behaviours such as exercise, or engage in social interactions with family and friends. Long commute times are also associated with sleep disturbance, low self-rated health and absence from work (Hansson et al. 2011). The project, along with the other approved WestConnex projects, aims to improve infrastructure and access within the urban environment. Therefore on a broader scale, while these long-term projects require management of construction impacts, they may assist in reducing stress and associated physiological and mental health impacts within the urban environment.

Measures provided by the project to reduce stress as a result of property acquisition are discussed in **section C11.16.1** and community change is discussed in **section C11.15.2**. Issues relating to compensation are discussed in **section C14.11**.

The community and stakeholder consultation for the project has involved activities prior to and during the exhibition of the EIS including an online 'Have your say' form, community information sessions, feedback on a concept design report and statutory consultation periods. This provided communities with the opportunity to contribute to the project design and development. Further discussion relating to consultation is provided in **Chapter C7** (Consultation). A description of future consultation activities for the project is outlined in **section A2.5**.

C11.17 Cumulative human health impacts

67 submitters have raised issues regarding cumulative human health impacts. Cumulative impacts on human health during operation of the project were summarised in section 26.4 of the EIS.

C11.17.1 Impacts from cumulative emissions

Submitters raised concerns about the health impacts which may arise due to cumulative emissions with other projects. This included concern with human health impacts from:

- Construction from multiple projects over extended periods of construction
- Changes in air quality from the WestConnex component projects and the Western Harbour Tunnel project
- Changes in air quality from ventilation facilities for the M4 East the New M5 projects together with the M4-M5 Link project
- Cumulative health impacts from aircraft emissions and construction emissions from the Darley Road civil and tunnel site (C4) as emissions and particulate matter can become wedged deep in the lung and possibly enter the bloodstream.

Response

Construction

Longer duration construction impacts may result from multiple projects being constructed concurrently (ie at the same time) or consecutively (ie one after the other over an extended period), thereby impacting local amenity, noise and air quality. Other impacts on health and wellbeing are associated with cumulative traffic impacts (including spoil vehicle movements, partial and/or complete closure of roads and active transport links, reduced street parking, and relocation of bus stops). Impacts on views and visual amenity from multiple concurrent or consecutive projects may also increase the levels of stress and anxiety experienced by community receptors.

Management and mitigation measures to address these impacts, where reasonable and feasible, are described in **Chapter E1** (Environmental management measures).

Operation

Potential impacts to human health that may be experienced during operation relate mainly to air quality emissions under the cumulative modelling scenario for 2023 (opening year) and 2033. The methodology for the cumulative air quality assessment, and how other WestConnex projects were assessed, is discussed in **section C9.20.1**. Emissions from existing industry including Sydney Airport and the White Bay cruise ship terminal, are part of the background air quality which is the baseline used for all of the modelled scenarios including cumulative scenarios (refer to section 9.2.7 of the EIS). As the air quality assessment supported the human health risk assessment, emissions from these sources were therefore included.

The human health risk assessment evaluated the principal pollutants identified in the air quality assessment which may impact ambient air quality. The assessment determined that these pollutants, including VOCs, PAHs, CO and NO_2, were not associated with any acute or chronic risk issues in the local community, when considered cumulatively with other projects. The cumulative health risk assessment concludes that predicted changes for ground level particulate matter (PM_{10} and $PM_{2.5}$) due to the 'cumulative' scenario (compared to the 'with project' scenario) would not be measurable. The cumulative assessment scenarios presented in the EIS were:

- 2023 – 'Do something cumulative' (with M4-M5 Link): includes M4 Widening, M4 East, New M5, M4-M5 Link, King Georges Road Interchange Upgrade, Sydney Gateway and the Western Harbour Tunnel
- 2033 – 'Do something cumulative' (with M4-M5 Link): includes M4 Widening, M4 East, New M5, M4-M5 Link, King Georges Road Interchange Upgrade, Sydney Gateway, Western Harbour Tunnel, Beaches Link and the F6 Extension.

For receptors located at elevated heights, such as in high rise buildings, the assessment concluded that at a height of 10 metres the maximum predicted change in $PM_{2.5}$ in the 'cumulative' scenario (compared to the 'with project' scenario) is lower than at ground level.

At a height of 30 metres, the maximum predicted change in $PM_{2.5}$ in the 'cumulative' scenario (compared to the 'with project' scenario) is significantly greater than at a height of 10 metres, close to the ventilation outlets. The impacts identified at 30 metres above ground, localised to the ventilation outlets, are considered to be greater than the acceptable standard for future high-rise development above 10 metres without mitigation measures. The maximum increases are located adjacent to the Campbell Road ventilation facility at the St Peters interchange which would have ventilation outlets which service the M4-M5 Link and the New M5 projects. Conversely, at the closest existing residential area, the maximum increase at a height or 30 metres is considered to result in a risk which is tolerable/acceptable in relation to the applicable standards. In addition to the potential planning controls to restrict building heights, further mitigation may include a range of architectural measures to reduce exposure to emissions such as low-level air conditioning, air intakes, enhanced sealant quality on windows and other design features.

C11.17.2 Impacts from cumulative noise

Submitters raised concerns regarding cumulative health impacts from aircraft noise and construction noise from the Darley Road civil and tunnel site (C4), which could increase blood pressure and risk of stroke.

Response

Noise monitoring results obtained for the EIS between July and November 2016 is inclusive of aircraft flyovers. The background noise level is used to establish construction noise management levels and fixed facilities noise criteria. This approach is consistent with the ICNG and INP (NSW EPA 1999), and result in a more conservative assessment of construction noise and operational noise from fixed facilities.

Aircraft noise and impacts associated with Sydney Airport would be addressed and managed by the airports governing authority. While noise from aircraft fly overs is recognised as a feature of the local ambient noise environment (see further response in **section C10.9.1**), the assessment of impacts from aircraft fly overs is not required to be assessed for the project, in accordance with relevant noise guidelines.

Cumulative noise impacts are assessed in section 26.4.3 of the EIS. Further discussion regarding cumulative noise impacts is provided in **section C10.14.1**.

C11.18 Human health environmental management measures

35 submitters have raised issues regarding environmental management measures to mitigate human health impacts. Management measures relating to human health are provided in **Chapter E1** (Environmental management measures).

C11.18.1 Concerns with human health environmental management measures

Submitters raised concerns regarding environmental management measures to mitigate human health impacts. Submitters raised queries and requested further mitigation measures relating to the following:

- More robust and timely measures and should be prescribed (including provisions for compensation)
- Greater assurances that the provision of management measures would minimise or eliminate health impacts to the community, with particular consideration of children and those susceptible to mental health conditions (stress) and pre-existing respiratory conditions
- Monitoring and measurement of potential incidences of health impacts is required (specifically requested at Rozelle Public School and Haberfield Public School)
- Individuals with pre-existing respiratory conditions should be monitored with a view to provide measures that minimise or eliminate health impacts
- Ongoing compliance with proposed measures should be actioned, regulated and enforced.

Response

Impacts to human health will be minimised through implementation of the environmental management measures identified for potential impacts resulting from traffic and transport; noise and vibration, air quality and social and economic changes. These measures, including proposed monitoring, are presented in **Chapter E1** (Environmental management measures).

Should the project be approved, it is anticipated that there will be a requirement within the conditions of approval to undertake ambient air quality monitoring around the ventilation outlets at least one year prior to opening and continue this monitoring for at least two years after opening. This is consistent with the conditions of approval for other approved tunnel projects such as NorthConnex. The locations of the monitors would be agreed with an Air Quality Community Consultative Committee. Rozelle Public School would be considered as an option. An air quality monitoring station is currently being installed at Haberfield Public School, located around 400 metres from the Parramatta Road Ventilation Facility (at the corner of Wattle Street and Parramatta Road) as part of the M4 East project. Further details relating to air quality monitoring is provided in **section C9.18.1**.

Long term health impacts assessed in the human health risk assessment found that potential changes in air quality as a result of the project were acceptable in relation to the applicable standards. Monitoring of human health incidents directly would not be undertaken as part of the project. One of the functions for the Population and Public Health Division of NSW Health, supported by local councils, is to monitor health incidents as well as identify and report on trends in the health of the population. This information is publicly available via the NSW Health website[3]. Issues relating to compensation are discussed in **section C14.11**.

[3] http://www.health.nsw.gov.au

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C12 Land use and property

This chapter addresses issues raised in community submissions associated with the land use and property assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 12 (Land use and property) of the EIS for the further detail on the land use and property assessment.

Contents

C12.1 Level and quality of land use and property assessment

156 submitters raised concerns about the level and quality of the land use and property assessment. Refer to section 12.1 of the EIS for details of the land use and property assessment methodology.

C12.1.1 Request for information

A diagram of the areas of land to be occupied during construction and operation at King George Park was requested, so that the submitter can better understand the impacts.

Response

Chapter 5 (Project description) of the EIS described the location of permanent operational infrastructure for the project, including a bioretention facility for stormwater runoff at the informal car park at King George Park at Rozelle (adjacent to Manning Street). However, section 12.3.2 of the EIS noted that the proposed location of the bioretention facility on Manning Street at Rozelle is on land currently subject to an undetermined Aboriginal Land Claim lodged by the Metropolitan Local Aboriginal Council (over Lot 662 in Deposited Plan 729277). Given the uncertainty regarding the future outcome and timing of resolution of this claim, an alternative location for the bioretention facility was investigated and is described and assessed in **Part D** (Preferred infrastructure report). This change would also address concerns raised in community submissions on the EIS relating to temporary impacts on the informal car park within King George Park adjacent to Manning Street.

The proposed location for the bioretention facility is around 150 metres north of the location presented in the EIS, adjacent to Victoria Road at the eastern abutment of the Iron Cove Bridge and still within King George Park, as shown in **Figure C12-1**. Part of the land that would be occupied by the bioretention facility at this location is located partially outside the project footprint assessed in the EIS. As a result of moving the bioretention facility, the existing informal car park within King George Park adjacent to Manning Street will not be impacted by the project.

A description of the revised location of the bioretention facility is provided in **Chapter D3** (Relocation of the bioretention facility at Rozelle). A photo of the new proposed location is provided in **Figure D3-2**.

The project footprint shown in **Figure C12-1** also includes land within King George Park south of Victoria Road which would be required to facilitate widening of the westbound carriageway of Victoria Road, as described in Chapter 5 (Project description) of the EIS. During construction, a portion of the Bay Run would be slightly adjusted to facilitate construction of the bioretention facility. The permanent realignment would be generally consistent with that described and assessed in Chapter 5 (Project description) of the EIS and access along the Bay Run would be maintained throughout construction. Other pedestrian paths that cross under Iron Cove Bridge would not be impacted.

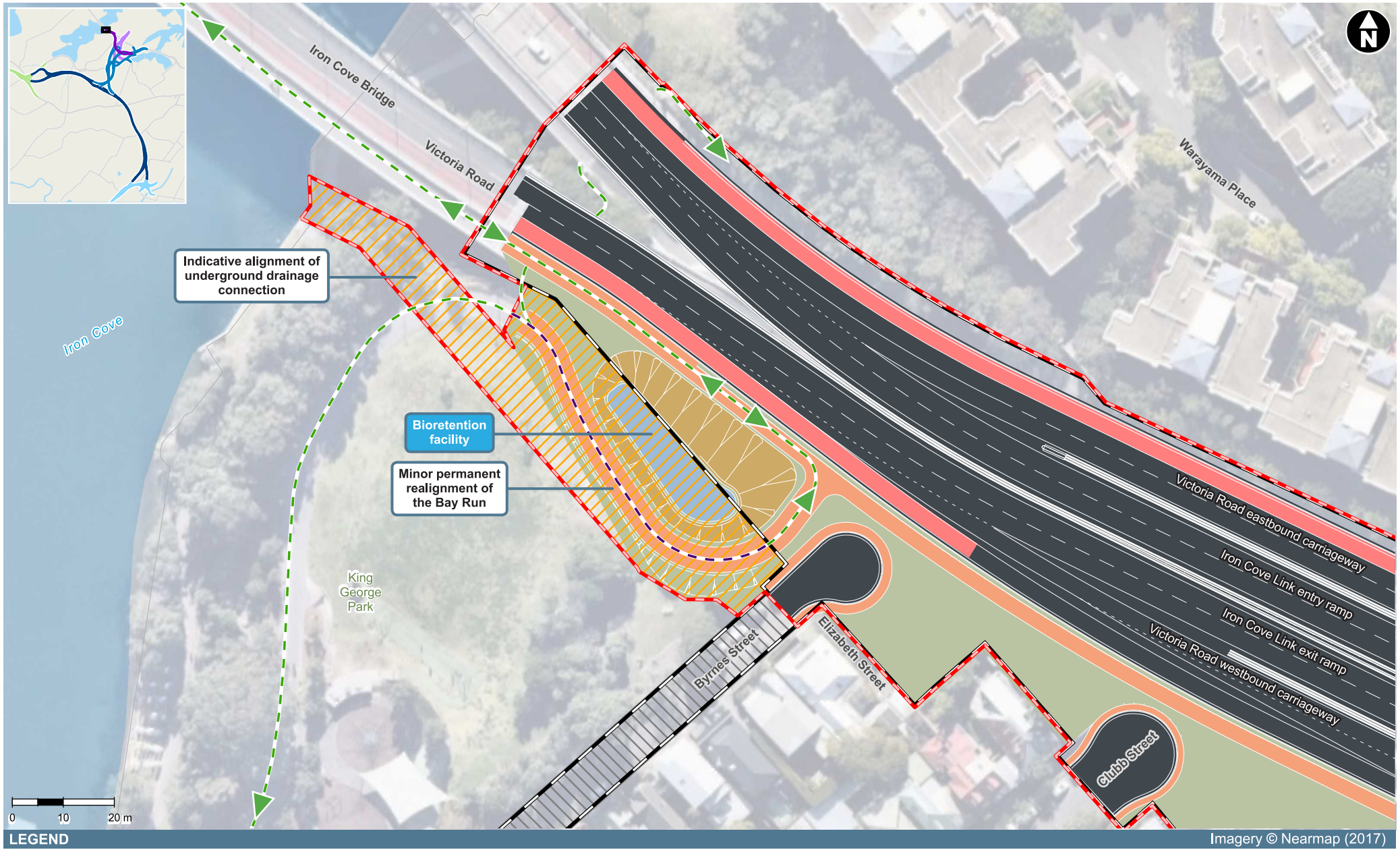

Figure C12-1 Revised location for the bioretention facility at Rozelle near Iron Cove Bridge

C12.1.2 Presentation of existing open space in the EIS

One submitter was concerned that the information regarding existing open space is not well presented in the EIS.

Response

Areas of existing open space in the vicinity of each of the proposed surface work sites are described in section 12.2.2 of the EIS.

The only areas of open space that would be directly impacted by the project are Buruwan Park near The Crescent and a portion of King George Park (see **section C12.1.1**). These impacts are discussed further in **section C12.7.1**.

C12.1.3 Level and quality of land use and property assessment

Submitters raised concerns about the level and quality of the land use and property assessment in the EIS. Specific queries included:

- Concern that the way that land use was assessed in the EIS was inaccurate
- Submitter objects to Chapter 2 of Appendix F (Utilities Management Strategy) of the EIS which does not provide sufficient detail about utility work and specific areas of interest
- Concern that there is insufficient evidence behind the claim that existing services at the Option B Parramatta Road construction sites would not be impacted by the project
- Believes that the proposal ignores basic good practice in land use and transport planning
- Believes that the development of various parts of Sydney in close proximity to the project alignment has not been considered in the proposal
- Concern that changes to land use forecasts since Stage 1 and Stage 2 are not quantified or mentioned within the EIS
- The assessment uses the Sydney Regional Environmental Plan No. 26 – City West (SREP 26 – City West) instead of *The Bays Precinct Transformation Plan* (UrbanGrowth NSW 2015) for its vision for the future character of The Bays Precinct
- Concern that the report does not contain any detail regarding shadow impacts to surrounding residential properties
- Concern that no assessment of the overshadowing from potential noise barriers during construction has been undertaken.

Response

An assessment of the potential land use and property implications of constructing and operating the project is provided in Chapter 12 (Land use and property) of the EIS. The assessment was undertaken in accordance with Secretary's Environmental Assessment Requirements (SEARs) for the project.

The assessment describes the framework for integrated land use and transport planning and how the project interacts and supports the objectives of the framework, and provides an assessment of the potential impact on land use and property as a result of the concept design for the project.

Assessment of utilities

A Utilities Management Strategy was developed for the EIS to respond to the SEARs regarding the management of trunk utilities during the construction of the project (refer to Appendix F (Utilities Management Strategy) of the EIS). This strategy details the major trunk utility works proposed as part of the project based on the concept design presented in the EIS. Major trunk utility works are subject to the Utilities Management Strategy because these works have the longest lead times and may potentially result in more substantial environmental and community impacts. This approach is consistent with the requirements of the SEARs.

This Utilities Management Strategy provides information in relation to:

- Utility installation, protection, relocations, adjustments and new connections (defined as utility works) which are proposed within the project footprint. These utility works have been assessed as part of the EIS and would be subject to a Utilities Relocation Management Plan, if the works are to be carried out prior to approval of a Construction Environmental Management Plan (CEMP), or otherwise would be subject to the CEMP
- Utility works which may be required outside of the project footprint. This Utilities Management Strategy provides information on the type of utility works likely to occur outside of the project footprint, the areas where this work is likely to occur and the framework for how these utility works would be managed. This includes requirements for stakeholder and community consultation, environmental constraints analysis and environmental risk assessment.

The utility services which have been considered in this Strategy include: communications, gas, electricity (including Ausgrid and Sydney Trains infrastructure), water, sewerage and drainage.

The purpose of the Utilities Management Strategy is:

- To outline the main trunk utility works currently proposed as part of the project
- To outline the options currently being considered for the provision of construction power supply and permanent operational power supply for the project
- To outline the options currently being considered for the upgrade of existing drainage infrastructure or provision of new drainage infrastructure for the project
- To provide an overview of how the utility works, including power supply and drainage works would be carried out
- To assess the range of potential environmental impacts associated with utility works, including cumulative impacts
- To identify and assess potential impacts to existing utility assets
- To provide an environmental constraints analysis for areas outside of the project footprint where utility works, such as construction and operational power supply connections, are likely to be required
- To outline a range of mitigation measures which would be applied to minimise the potential environmental impacts
- To outline a process for how utility works that are not assessed as part of the EIS would be managed including requirements for:
  - Obtaining agreements with utility service providers
  - Effective co-ordination of utility adjustment works
  - Consideration of route options where appropriate
  - Undertaking environmental constraints analysis and risk assessment to confirm potential environmental impacts and appropriate management measures
  - Stakeholder and community consultation and notification.

Existing utility services (underground and overhead services) have been identified by:

- Dial-Before-You-Dig data searches
- Review of plans and drawings provided by utility service providers
- Site walkovers
- Use of electronic tracing and ground penetrating radar
- Surface level survey.

Investigations are continuing in consultation with utility service providers to identify the utility works required as part of the project.

It is proposed that more detailed investigations would be carried out once further consultation with relevant utility service providers has occurred and a detailed design for the proposed works is developed by the contractor(s). The process for confirming the detail of the utility works and typical measures for managing the environmental impacts of the utility works are outlined in Appendix F (Utilities management strategy) of the EIS.

Section 3.2 of Appendix F (Utilities management strategy) of the EIS describes the proposed utility works at Haberfield for the project. For the two Option B construction sites located on Parramatta Road (C1b and C3b), the existing utility services in this area include Sydney Water sewer and water mains, Telstra communications cables and Ausgrid transmission cables in Parramatta Road, Bland Street and Alt Street. None of these utility services would be directly impacted by the project. These utility services are listed in Table 3-2 of Appendix F (Utilities management strategy) of the EIS together with proposed management measures.

The Utilities Management Strategy will be implemented for the project as per environmental management measure PL14 (see **Chapter E1** (Environmental management measures)).

Integration with strategic land use planning and surrounding development

Land use changes as a result of the project would occur largely in response to the introduction of new construction and/or transport infrastructure at Haberfield, Ashfield, Leichhardt, Lilyfield, Rozelle, Annandale and St Peters. Development in proximity to the project at these locations has been considered in the EIS through a review of NSW strategic planning and transport infrastructure policies including:

- *NSW Long Term Transport Master Plan* (Transport for NSW 2012b)
- *Sydney's Rail Future: Modernising Sydney's Trains* (Transport for NSW 2012a)
- *Sydney City Centre Access Strategy* (Transport for NSW 2013)
- State and Premier priorities (NSW Government 2015)
- *A Plan for Growing Sydney* (NSW Government 2014a)
- *Rebuilding NSW: State Infrastructure Strategy 2014* (NSW Government 2014b)
- *The Bays Precinct Transformation Plan* (UrbanGrowth NSW 2015)
- *Parramatta Road Corridor Urban Transformation Strategy* (UrbanGrowth NSW 2016)
- *Draft Central District Plan* (Greater Sydney Commission 2016).

These strategic plans and policies provide goals and objectives for land use planning within the Sydney metropolitan area, including consideration of the role of transport infrastructure in accommodating the future housing, transport, employment and amenity needs of Sydney's growing population. Local plans and policies have also been considered in the development of the project. The project presents opportunities to support a number Sydney's integrated land use and transport planning objectives (see section 12.1.2 and Chapter 3 (Strategic context and project need) of the EIS for further information).

Consideration was given to updated or new strategic documents (since the approval of the M4 East and New M5 projects) for the development of the project, such as the *Parramatta Road Corridor Urban Transformation Strategy* and *Draft Central District Plan*[1] (Greater Sydney Commission 2016). Updated land use and population forecasts were considered in the traffic modelling for the project including the NSW Department of Planning and Environment's updated land use forecasts, including in particular revised land use development along Parramatta Road, at The Bays Precinct, Green Square and at Mascot town centre.

The Bays Precinct Transformation Plan is not a statutory planning instrument. SREP 26 - City West is the applicable statutory planning instrument as it applies to land around the Rozelle interchange. Notwithstanding, the EIS has considered *The Bays Precinct Transformation Plan* as part of the strategic planning context of the project (see **section C12.8.3** for further information).

See **Chapter C3** (Strategic context and project need) for further response to community concerns related to the strategic context of the project.

[1] Since the exhibition of the EIS, this plan has been replaced by the *Draft Revised Eastern City District Plan* (Greater Sydney Commission 2017)

Overshadowing during operation

Overshadowing impacts are described in section 12.4.12 of the EIS and are supported by shadow diagrams prepared for operational project infrastructure which are included in Appendix M (Shadow diagrams and overshadowing) of the EIS. Further information regarding overshadowing is included in **section C12.10**.

Impacts from noise barriers

Potential operational noise performance of the project based on the detailed design will be assessed in accordance with NSW Road Noise Policy (NSW Department of Environment Climate Change and Water 2011) and appropriate management measures will be confirmed and implemented (see environmental management measure NV13 in **Chapter E1** (Environmental management measures)). In addition, within 12 months of the commencement of the operation of the project, actual operational noise performance will be assessed and compared to predicted operational noise performance. The assessment will include identification of any further feasible and reasonable noise mitigation measures required to meet the relevant operational road traffic noise criteria, and identify timing and responsibilities for implementation (see environmental management measure NV14 in **Chapter E1** (Environmental management measures)).

As the final location of permanent noise barriers are not confirmed, further assessment of potential impacts associated with the noise barriers is not included in the EIS. If noise barriers are deemed necessary for the project, their location, form and function, and associated impacts (such as overshadowing), will be assessed during detailed design.

The following issues are to be considered in determining whether a noise barrier would be a feasible and reasonable option:

- Potential visual impacts
- Potential urban design impacts
- Potential community safety/crime prevention considerations such as isolated walkways
- Impacts of a barrier on traffic and pedestrian connectivity between Victoria Road and the local road network
- Potential overshadowing impacts
- Form of future development of the residual land which may itself provide a barrier to traffic noise
- Preferences of the local community as gauged during the community consultation phase.

C12.1.4 Assessment of settlement impacts

Submitters expressed concerns in regards to the level and quality of assessment of potential impacts to property as a result of settlement. Specific queries included:

- Concern that there has been an inadequate assessment of the potential impact that tunnelling may have on properties in Newtown and St Peters where the tunnel would only be 15 metres below ground
- Submission believes that the EIS does not provide sufficient details of the access tunnel from the Darley Road civil and tunnel site (C4) to the mainline tunnel. Submission would like additional details within the EIS regarding the depth that the tunnel would need to be to not damage properties
- Whether the tunnels 10 metres in depth have been considered within the settlement analysis
- The settlement assessment is based on assumptions around settlement and the EIS should not be approved until a thorough assessment is undertaken and publicly published
- Concerns that the estimates of subsidence are questionable as the locations are unclear and unplanned. Submitter also believes that the geological location of the alignment would require dewatering which would continue to cause subsidence for decades to come
- Concern that impacts of settlement on services (such as Sydney Water and Ausgrid services) were not assessed in the EIS
- Concerns that the impact from groundwater withdrawal induced settlement on properties has not been modelled in the EIS. Submitter has requested that groundwater withdrawal induced

settlement is included in the modelling to ensure that the relevant criteria for settlement are not going to be exceeded for properties. It is also requested that settlement monitoring program be implemented

- Concerns that the information presented in the EIS in regards with the impacts of settlement induced by groundwater withdrawal on ground movement is misleading and not adequate because the estimate of ground movement (as published in Chapter 12) excluded the impact of groundwater drawdown
- Uncertainty regarding which properties and infrastructure would be predicted to exceed the settlement criteria due to localised groundwater modelling not being undertaken
- Concern that the SEARs requirement about the temporary and permanent groundwater drawdown and potential settlement assessment have not been addressed in the EIS.

Response

Potential impacts from ground movement are assessed in section 12.3.4 of the EIS. A preliminary assessment has been carried out based on the concept plan to assess the potential for ground movement and angular distortion as a result of the project. The results of this preliminary assessment are presented as ground movement contours and angular distortion contours and are shown in Figure 12-16 to Figure 12-30 of the EIS.

Further assessment of potential settlement impacts, including numerical modelling, will be undertaken during detailed design. In areas where ground movement in excess of settlement criteria is predicted, a range of design, construction methodology and ground improvement options are available to minimise settlement. An instrumentation and monitoring program to measure settlement, distortion or strain will be implemented (see **section C12.5.3** and **Chapter E1** (Environmental management measures)).

An Independent Property Impact Assessment Panel will be established prior to the commencement of works with the potential to result in ground movement and settlement or damage due to vibration. The panel will independently review the building condition survey process and check that the reports are adequate to assist with any property damage disputes. The panel will include at least one specialist with experience of ground movement and settlement due to excavations (see environmental management measure PL11 in **Chapter E1** (Environmental management measures)).

All project tunnels, including shallow components closer to the tunnel portals and the temporary access tunnel at Darley Road, have been considered in the preliminary assessment of settlement in section 12.3.4 of the EIS.

The preliminary assessment of potential settlement impacts in section 12.3.4 of the EIS includes an assessment of impacts on major Sydney Water utility services (such as the Pressure Tunnel and the City Tunnel). For other utilities, consultation would occur with the relevant utility service provider regarding the potential impact of the project on existing utility services. This would include establishing appropriate settlement and vibration criteria, carrying out further assessments of potential impacts and monitoring of impacts if required and would occur prior to the commencement of any construction potentially affecting the individual utilities or infrastructure.

Interface agreements would be agreed with the owners of infrastructure and utility services likely to be impacted by construction of the project. These agreements would consider establishing appropriate settlement criteria for utilities (see environmental management measure PL12 in **Chapter E1** (Environmental management measures)).

Settlement associated with groundwater drawdown

The preliminary assessment does not include prediction of settlement as a result of groundwater drawdown (consolidation settlement). In contrast to predicting tunnel excavation-induced ground movement, which has a well-documented and accepted methodology, prediction of consolidation settlement relies on the prediction of induced groundwater drawdown, which is complex and subject to significant uncertainties.

Settlement that occurs due to groundwater drawdown is gradual and generally occurs at a slower rate (possibly over years). It can sometimes also be difficult to distinguish from settlement due to groundwater drawdown that may be naturally occurring; or occurring due to another influence; or occurring as a result of seasonal variations which can cause swelling or shrinkage of the soil. The extent of groundwater drawdown often occurs over a wider area beyond the location of the tunnels and results in a wider and shallower settlement trough which is less likely to result in tensile strain on buildings and building damage.

The risks associated with groundwater drawdown and induced settlement within the Ashfield Shale and Hawkesbury Sandstone is considered low because of the geotechnical properties of the rock. As water is removed from these rock types the structural integrity and strength of the rock remains due to its competent nature. As a result, cumulative settlement impacts (ie settlement due to both the removal of material and groundwater drawdown) are not anticipated to be an issue for tunnels excavated in the Hawkesbury Sandstone or Ashfield Shale.

In contrast, as groundwater drawdown occurs within the alluvium the structural integrity of the unconsolidated sediment is compromised resulting in more settlement than would be expected from the sandstone and shale. Cumulative settlement impacts in the alluvium would be minimised by including tanked tunnel sections through the alluvium or by aligning the tunnels beneath the palaeochannels thereby minimising groundwater leakage.

Further assessment of potential settlement impacts, including numerical modelling, will be undertaken during detailed design. In areas where ground movement in excess of settlement criteria is predicted, an instrumentation and monitoring program to measure settlement, distortion or strain will be implemented. Feasible and reasonable measures will be investigated and implemented to ensure where possible that the predicted settlement is within the criteria (see **section C12.5.2** and environmental management measure PL7 in **Chapter E1** (Environmental management measures) for further information). Further details regarding predicted groundwater drawdown and associated settlement impacts are provided in **section C12.5** and Chapter 19 (Groundwater) of the EIS.

C12.2 Surface property acquisition

1,109 submitters have raised issues regarding surface property acquisition. Refer to section 12.3 of the EIS for details on potential property impacts.

C12.2.1 Need and justification for private property acquisition

Submitters expressed concern regarding the need to acquire private properties. Submitters were also opposed to, or sought additional information regarding, the justification for acquiring properties. In particular submitters raised the following issues:

- Concern about loss of private homes and businesses
- Concern that additional residential properties and businesses would be acquired in the future as a result of changes to the project or future WestConnex expansions
- Concern that the list of properties that would be impacted is indicative only
- Acquired land that is subject to development applications has been undervalued
- Concern that private property acquisition will alienate surrounding properties
- Additional properties should be acquired around proposed work sites to act as a buffer
- Acquisitions should be consistent with the Policy on the Heritage Impacts of Urban Motorways from the National Trust of Australia.

Response

The project has been designed and developed to minimise the need for surface property acquisition and occupation. This was achieved by:

- Locating large sections of the project, including the Rozelle interchange, below ground
- Utilising areas that are within the project footprint of the M4 East and New M5 projects, where possible

- Utilising government owned properties where possible, such as at the Rozelle Rail Yards and Darley Road civil and tunnel site.

Surface property acquisition is required for the project for the following reasons:

- The project is located in a developed, urban environment and there is limited nearby land that is undeveloped and suitable for the project
- Land is required for mid-tunnel sites (such as Darley Road civil and tunnel site (C4) and Pyrmont Bridge Road tunnel site (C9)) to expedite tunnelling and shorten the construction period for the project and duration of associated amenity impacts
- The increased capacity of surface roads and the construction of new interchanges require road widening and associated acquisition of land adjacent to the road corridor.

The need to reduce surface property acquisitions has been balanced with maximising opportunities for beneficial re-use of the areas required for construction that would be surplus to the operational needs of the project. Notwithstanding this design intent, construction and operation of the project would result in temporary and permanent impacts on property.

The project would also use government owned land, including land already owned by Roads Maritime. Where this land is not already in NSW Roads and Maritime Services (Roads and Maritime) ownership and is required for permanent use, Roads and Maritime would enter into agreements with the relevant government departments - including acquisition or lease arrangements. Where government owned land not owned by Roads and Maritime is required temporarily, this would generally be established through a lease or a Memorandum of Understanding.

As of August 2017, the project would require 51 total surface property acquisitions. These property acquisitions are summarised in **Table C12-1**. Roads and Maritime would also be required to manage a number of leases on land subject to acquisition.

Table C12-1 Indicative property acquisition requirement for the project

Location	Land use (type)	No. of total acquisitions[1]
Wattle Street interchange surface works	Acquisitions were carried out at this location as part of the M4 East project	None[2]
Parramatta Road West and East civil and tunnel sites	Mixed use	1
Darley Road surface works	Commercial	1
Rozelle surface works	Commercial/industrial	4
Iron Cove Link surface works	Residential	26
	Commercial/industrial	10
Pyrmont Bridge Road tunnel site	Commercial/industrial	9
St Peters interchange surface works	Acquisitions were carried out at this location as part of the New M5 project	None[3]

Notes:
1 Multiple strata titles may exist within each parent lot to be acquired
2 Refer to the M4 East EIS (September 2015) for acquisitions that occurred at this location
3 Refer to the New M5 EIS (November 2015) for acquisitions that occurred at this location.

Where land required for the construction and/or operation of the project is not currently owned by the NSW Government, discussions are being held with the affected landowners concerning the purchase, lease or licence of the land.

All property acquisition undertaken by the NSW Government is in accordance with the *Land Acquisition (Just Terms Compensation) Act* 1991 (NSW) and the reforms announced in October 2016 (NSW Government 2016b). Information about the property acquisition process and the reforms can be viewed online[2].

[2] www.propertyacquisition.nsw.gov.au

The concept design for the project would continue to be refined, where relevant, to improve road network and safety performance, minimise impacts on sensitive receptors and the environment, and in response to feedback from stakeholders and the community. The concept design identifies the extent of property acquisition required for project. In the event that further acquisitions are required, these would be subject to separate environmental assessment and approval and are outside the scope of the project. Further information regarding the assessment of a concept design for the project is provided in **section C2.1.2**.

The M4-M5 Link is the final stage of the WestConnex program of works. Acquisitions for future transport infrastructure projects or modifications to existing projects are outside the scope of this project.

The project would not impact on land subject to development applications.

The impact of property acquisitions on land uses of adjoining properties is considered in section 12.4 of the EIS. The project would not rezone or consolidate remaining project land and therefore there would be no permanent changes to land use zoning for future development around properties adjacent to land to be acquired for the project. Further details on the potential development and/or use of remaining project land would be outlined in the Residual Land Management Plan (RLMP) that would be prepared for the project.

The Policy on the Heritage Impacts of Urban Motorways from the National Trust of Australia is not a statutory or government policy document and is therefore not required to be considered with regard to property acquisitions. Potential impacts to non-Aboriginal heritage are described in Chapter 20 (Non-Aboriginal heritage) of the EIS.

C12.2.2 Adequacy and equitability of the property acquisition process

Submitters expressed concern that the property acquisition process is inequitable, that compensation of homeowners and tenants is inadequate and that the process has been poorly managed. Specific queries included:

- Land obtained through acquisition for the project would be owned by a private company
- Question regarding how the acquisition process would be improved based on the acquisition process for previous WestConnex projects
- Properties have been acquired before the project has been approved
- Properties have been acquired with a lack of care for residents and businesses
- Concern that businesses have needed to attend court to seek fair compensation for acquisition
- Concern that the Project has not abided by the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW)
- Acquired properties have been undervalued
- Concern regarding property acquisition support services
- Concern that acquired land would be sold off at a later date
- The EIS is unclear about future property acquisitions at Haberfield and more clarity should be provided
- Acquisition is not consistent with the objectives of SREP 26 - City West.

Response

Land acquired for the project would be owned by Roads and Maritime, not Sydney Motorway Corporation (SMC). Roads and Maritime is the proponent for the project and has commissioned SMC to deliver WestConnex, on behalf of the NSW Government.

All property acquisition undertaken by the NSW Government is in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW) and the reforms announced in October 2016 (NSW Government 2016b). Information about the property acquisition process and the reforms can be viewed online[3].

[3] www.propertyacquisition.nsw.gov.au

The reforms were implemented as a result of a review of the existing acquisition process, which demonstrated that although the legislative framework for land acquisitions was sound, there was more work to be done to ensure that a stressful and complex situation is made as easy as possible. The new approach has a greater focus on providing support to affected residents and business owners with their relocation. Each property owner or tenant is now assigned a personal manager as a consistent point of contact throughout the acquisition process and to provide relocation assistance. Property owners must now be given at least six months to reach a compensation agreement before the compulsory acquisition process can start.

Roads and Maritime advises property owners of impacts on their property at the earliest possible time and provides as much flexibility as possible regarding the timing of the acquisition and relocation process. These discussions with property owners need to start before the project is approved to allow adequate time for the acquisition process and ensure properties are available in time to meet project milestones.

The acquisition process for all properties required for the M4-M5 Link has started and all landowners have been notified. At Haberfield, the Wattle Street interchange surface works would be carried out within the existing road reserve (Wattle Street) or on land being used as construction ancillary facilities for the M4 East project. The M4-M5 Link project would not require additional property acquisition for these works.

The M4-M5 Link project would require the acquisition of one mixed use property for the Parramatta Road West site at Ashfield. Refer to Table 12-2 of the EIS for property acquisition required for the project.

Roads and Maritime has already reached agreement with the majority of property and business owners affected by M4-M5 Link acquisitions. If agreement is not reached, the Valuer General will determine the amount of compensation payable. If a property or business owner does not accept the amount of compensation determined by the Valuer General, they can lodge an objection with the Land and Environment Court.

Sydney Regional Environmental Plan (SREP) No. 26 — City West

The principal aims of SREP 26 – City West are to promote the orderly and economic use and development of City West by establishing planning principles and controls for the City West area. The provisions of SREP 26 – City West would not apply to the project as prescribed by section 115ZF(2) of the *Environmental Planning and Assessment Act 1979* (NSW) as the project has been declared to be critical State significant infrastructure. Notwithstanding this, the relevant SREP 26 – City West objectives, planning principles and policies are discussed in Table 2-2 of the EIS. SREP 26 – City West only includes one provision relevant to the acquisition of land however the application of this provision is limited to a specific area of land (within the Public Recreation Zone) that the project would not impact.

C12.2.3 Property acquisition at the Darley Road civil and tunnel site (C4)

Submitters expressed opposition to the acquisition of a commercial premise located at the proposed Darley Road civil and tunnel site (C4) for the project. Submitters were concerned that there would be property acquisition at James Street, Leichhardt for the Darley Road civil and tunnel site (C4).

Response

The Darley Road civil and tunnel site (C4) is currently occupied by a commercial premise on land that is being leased from Transport for NSW. The project would not require the acquisition of properties on James Street, Leichhardt.

C12.2.4 Property acquisition at the Pyrmont Bridge Road tunnel site (C9)

A submitter queried whether the project would result in the demolition of the industrial buildings on Bignell Lane or the terrace row housing on Pyrmont Bridge Road.

Response

The Pyrmont Bridge Road tunnel site (C9) would require the acquisition of nine existing commercial and industrial premises. The terrace housing on Pyrmont Bridge Road would not be demolished for the project. Refer to Figure 6-24 of the EIS for further detail regarding the extent of the Pyrmont Bridge Road tunnel site (C9).

C12.2.5 Acquisition of the commercial premises at Rozelle

A submitter expressed opposition to the acquisition of the commercial premises located at 68-72 Lilyfield Road at Rozelle for the project, for the following reasons:

- Submitter is dissatisfied that the property will be used during construction without providing alternative options or justification for the use of the site
- Submitter is dissatisfied that the site will be acquired to be used as passive open space post-construction.

Response

Land at 68-72 Lilyfield Road is required for the Rozelle civil and tunnel site (C5) during construction to facilitate the construction of the Rozelle interchange.

Throughout the development of the project, a number of potential construction ancillary facility sites were investigated but were excluded from the project for various reasons. These sites and the reasons they do not form part of the project are outlined in Table 4-7 of the EIS. Easton Park was considered to supplement the Rozelle civil and tunnel site (C5).

The use of Easton Park would require temporary loss of passive and active open space, vegetation removal and impacts on heritage items (Easton Park and Sydney Water sewage pumping station). Use of this site also required closure of part of Lilyfield Road. Community and stakeholder feedback requesting that impacts on public open space be avoided was also taken into consideration during relocation of the ancillary facility site. Design optimisation led to the relocation of cut-and-cover tunnel structures to within the Rozelle Rail Yards; therefore Easton Park could be avoided.

The land at 68-72 Lilyfield Road, Rozelle would become part of the (up to) 10 hectares of open space to be delivered at the Rozelle Rail Yards as committed to by the NSW Government (announced in July 2016) as described in Chapter 5 (Project description) of the EIS and shown in Appendix L (Technical working paper: Urban design) of the EIS.

The urban design and landscaping concept for the Rozelle Rail Yards would be refined in the development of Urban Design and Landscape Plans (UDLPs) for the project which would be prepared based on the detailed design and in accordance with relevant commitments in this EIS. The UDLPs would be prepared in consultation with relevant councils, stakeholders and the community. The provision of open space at the Rozelle Rail Yards which are currently disused and inaccessible to the public is considered to be a benefit provided by the project (refer to Chapter 13 (Urban design and visual amenity) of the EIS.

Tunnels for the Rozelle interchange would occupy a portion of the substratum at this property during operation.

C12.3 Subsurface property acquisition

One submitter has raised issues regarding subsurface property acquisition. Refer to section 12.3 of the EIS for details on subsurface acquisition for the project.

C12.3.1 Subsurface acquisition

One submitters requested clarification regarding subsurface acquisition and potential for associated compensation or acquisition of properties. The same submitter also raised concerns regarding the impact this would have on the future use of their properties.

Response

Refer to the Roads and Maritime fact sheet on property acquisition of subsurface lands dated January 2015 for information regarding subsurface acquisition[4]. Subsurface acquisition is discussed in section 12.3.3 of the EIS.

[4] http://www.rms.nsw.gov.au/documents/projects/factsheet-property-acquisition-of-subsurface-lands.pdf

C12.4 General damage to property

628 submitters raised concerns about damage to property. Refer to section 12.3 of the EIS for further details on property impacts.

C12.4.1 General damage to property

Submitters raised concerns about impacts to property in general caused by project activities. Areas of concern included:

- Damage to properties including damage to structural integrity of buildings with cracking and other structural issues resulting from the project
- Damage to heritage buildings
- Concern that the EIS has not included management plans to mitigate risks and impacts to properties, including a process for compensation or remediation
- Concern that insurance policies would not cover damage to properties
- Damage to property as a result of heavy construction vehicles and vibration from construction equipment
- Damage to properties from flooding as a result of damage to the stormwater drainage pipes under Easton Park resulting from project tunnelling
- Submitter believes that the assessment process for damage to property should be conducted regularly during construction.

Response

Measures to manage potential damage to property and measures to rectify property damage caused by the project, are provided in full in **Chapter E1** (Environmental management measures) and summarised in **section C12.12.2**. These include measures to manage potential property impacts due to settlement and ground movement.

An Independent Property Impact Assessment Panel will be established prior to the commencement of works with the potential to result in ground movement and settlement or damage due to vibration. The panel will be responsible for:

- Independently reviewing the building condition survey process and checking that the reports are adequate to assist with any property damage disputes
- Resolving any property damage disputes
- Endorsing the Settlement Monitoring Program and monitoring its implementation and ongoing adequacy.

The panel will include at least one specialist with experience with ground movement and settlement due to excavations.

As required by environmental management measure PL10 in **Chapter E1** (Environmental management measures), building condition surveys will be offered to property owners within the zone of influence of tunnel settlement (50 metres from the outer edge of the tunnels and within 50 metres of surface works) or as otherwise directed by the Independent Property Impact Assessment Panel. Building condition surveys of properties will be carried out prior to the commencement of any project works in the vicinity that have the potential to result in damage to the properties, as identified by the contractor and confirmed by the Independent Property Impact Assessment Panel. Building condition surveys will be carried out by a structural engineer.

In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified. The minimisation and rectification of damage to property during the construction of the project would be the responsibility of the design and construction contractor(s) for the project.

Any disputes between a property or infrastructure owners regarding damage and rectification will be referred to the Independent Property Impact Assessment Panel for resolution (refer to **Chapter E1** (Environmental management measures) for further details regarding the management of potential settlement impacts).

C12.5 Settlement impacts to property

1,294 submitters raised concerns about settlement impacts to property. Refer to section 12.3 of the EIS for details of potential impacts to property from ground movement.

C12.5.1 Technical aspects of settlement

Submitters raised questions concerning the likelihood and technical aspects of settlement. Specific inquiries and concerns included:

- Whether ground surface settlement is likely for the project
- Tunnels should be designed at depth to mitigate settlement impacts to avoid damage to properties
- What the observable effect in a house would be for settlement above 20 millimetres on old houses without sophisticated foundations
- Concern that settlement of five to 10 millimetres would create a trip hazard or other significant damage
- What the maximum settlement is likely to be, given above 20 millimetres is predicted
- Why the area in the vicinity Lord Street, Newtown is particularly affected by settlement
- The depth of the proposed future Western Harbour Tunnel connections should be increased to reduce ground settlement to below the 20 millimetre EIS criteria.

Response

Settlement for the project is likely, however over the majority of the project the predicted settlement is within acceptable settlement criteria. The preliminary settlement assessment of tunnel excavation induced settlement (excluding groundwater drawdown induced settlement) in section 12.3.4 of the EIS shows that over the majority of the tunnel alignment predicted ground movement is less than 20 millimetres, which is consistent with the most stringent maximum settlement criterion that has been specified in the conditions of approval for recent tunnelling projects in Sydney. These include the M4 East and New M5 projects and the NorthConnex project.

Criteria for maximum angular distortion and tensile strain are also included. These are a function of the settlement distribution across the ground surface, noting that differential settlement (small discrete areas of settlement which may impact the relative level of one component of a structure more than a different component) can potentially contribute to building damage. Criteria for limiting tensile strain has not been included for all recent tunnelling projects in Sydney, however it has recently been included as an amendment to the conditions of approval for the New M5 project because it is considered an indicator of potential property damage. These criteria are summarised in **Table C12-2**. As outlined above, the criteria represent the most stringent settlement criteria for other recent tunnelling projects.

Table C12-2 Settlement criteria

Beneath structure/facility	Maximum settlement	Maximum angular distortion (gradient of slope)	Limiting tensile strain (percent)
Buildings – Low or non-sensitive properties (ie less than or equal to two levels and carparks)	30 mm	1 in 350	0.1
Buildings – High or sensitive properties (ie greater than or equal to three levels and carparks)	20 mm	1 in 500	0.1
Roads and parking areas	40 mm	1 in 250	N/A
Parks	50 mm	1 in 250	N/A

For the majority of the proposed alignment the tunnels are located at depths of greater than 35 metres below ground level and within competent bedrock. As a result the risk of ground movement is limited. However, at a number of locations where the tunnels are rising to meet the surface roads the tunnelling is shallower, at depths of less than 20 metres below ground level. As the tunnels are required to meet the surface roads to connect with the metropolitan road network, it is unavoidable that some sections of the tunnel involve shallow tunnelling. Shallower tunnelling has a higher potential to cause settlement impacts. Locations where multiple tunnels are located close to each other can also be subject to increased settlement (the cumulative impact of multiple tunnels at one location has been considered in the preliminary assessment of settlement impacts outlined in section 12.3.4 of the EIS).

Settlement may induce damage to overlying structures such as cracking through concrete, masonry or plasterwork that result from tensile stain induced in the structure. Tensile strain depends on where the building is located with respect to areas of settlement.

The manner in which a building or structure responds to ground movement depends on its size, design, materials, foundations and age. For instance, a timber or steel framed structure may be flexible, deflecting as the ground moves whereas a masonry building if subject to similar ground movement may behave differently. Other relevant factors may include the overall height (number of storeys) of the building and whether the building has basement levels. As identified in **Table C12-2**, sensitive properties (such as listed heritage items or otherwise older buildings) would be subject to a lower maximum settlement and angular distortion criteria compared to non-sensitive properties.

A preliminary assessment has been carried out to assess the potential for ground movement and angular distortion as a result of the project. The method adopted to predict ground movement is the volume loss approach as described by Mair, Taylor and Burland 1996. The results of this preliminary assessment are presented as ground movement contours and angular distortion contours and are shown in Figure 12-16 to Figure 12-30 of the EIS.

There are a number of discrete areas to the north and northwest of the Rozelle Rail Yards, to the north of Campbell Road at St Peters and in the vicinity of Lord Street at Newtown where ground settlement above 20 millimetres is predicted. These areas generally coincide with the location of shallower tunnelling and/or where multiple tunnels are located in close proximity to each other. Maximum ground surface settlement at these locations is provided in section 12.3.4 of the EIS and in **section C12.5.2**.

The area in the vicinity of Lord Street at Newtown is affected by ground surface settlement because of the number and size of the proposed M4-M5 Link mainline and ramp tunnels located in close proximity to each other, including tunnels connecting to the St Peters interchange and tunnels connecting directly to the New M5.

Potential settlement associated with the proposed mainline and ramp connections to the proposed future Western Harbour Tunnel is primarily associated with multiple tunnels of the Rozelle interchange being located close to each other. The proposed tunnel design would be reviewed during detailed design to minimise settlement impacts where possible.

Considering the magnitudes of settlement assessed, damage to buildings is expected to be minimal and not cause significant damage such as changes in floor level that would introduce a trip hazard.

Measures to ensure ground movement impacts are managed are discussed in **section C12.5.3** and provided in full in **Chapter E1** (Environmental management measures).

Further assessment including numerical modelling will be undertaken during detailed design to determine the level of predicted settlement impacts and to develop appropriate measures to reduce settlement to within the criteria wherever possible (see **section C12.5.2** for further information).

C12.5.2 Damage to property due to ground surface settlement

Submitters raised concerns about potential damage to property from settlement. Specific queries are listed below:

- Concern around induced property damage, due to tunnelling
- Concern that the construction of four overlapping tunnels at varying depths would exacerbate the impact of ground settlement
- Concern over direct impact to non-Aboriginal heritage sites and residential properties due to ground movement; particularly the 13 storey tall heritage listed silo building located at Gladstone Street, Newtown

- Concern regarding impacts to properties above the Inner West subsurface interchange and Rozelle interchange, where tunnelling is less than 35 metres deep, specifically where the tunnels overlap
- Impacts from tunnelling may cause damage to the Malt Shovel brewery buildings and assets adjacent to the Pyrmont Bridge Road tunnel site
- Potential for damage to property due to tunnel excavation around James Street and Francis Street at Leichhardt
- Concern that ongoing significant subsidence may occur after construction of the tunnels due to groundwater drainage from the tunnels
- Concern that the Federation houses located above the Inner West interchange may be impacted by subsidence
- Specific concern in relation to damage to properties in areas of shallow tunnelling
- Concern that property insurance policies would not cover damage from settlement as a result of tunnelling activities
- Concerns about tunnelling and associated settlement and ensuring fuel tank integrity at service stations
- Concern that ongoing significant settlement from groundwater would result in the potential for further ground movement
- Concern that properties at Haberfield would be damaged due to subsidence
- Concerned that property damage will occur caused by changed soil moisture content.

Response

Ground movement during construction may occur in some areas along the tunnel alignment induced by tunnel excavation. The ground movement anticipated is predominantly settlement, which is downward (also termed subsidence, see **section C12.5.1**). Impacts related to settlement during operation would be from groundwater drawdown, which occurs over a longer timeframe compared to settlement impacts from tunnel excavation.

Areas most likely to be affected by settlement are usually where tunnelling is closest to the ground surface (shallowest), around the tunnel portals and entry and exit ramps, and where soils are more likely to be compressible. This would include the estuarine and alluvial soils and fill within the palaeochannel underneath the Rozelle Rail Yards. Locations where multiple tunnels are located close to each other can also be subject to increased settlement. A range of design, construction methodology and ground improvement options are available to minimise settlement (see below). Measures to ensure ground movement impacts in these locations are managed are discussed in **section C12.5.3** and provided in full in **Chapter E1** (Environmental management measures).

Settlement criteria have been specified in the conditions of approval for recent tunnelling projects in Sydney including the M4 East and New M5 projects and the NorthConnex project. These criteria are summarised in **Table C12-2** and it is expected similar criteria would be adopted for this project. The criterion limiting of tensile strain is considered to be an indicator of potential building damage. This criterion sets a limit on the deformation that can occur within a material in order to minimise the potential for damage such as cracks or breaks.

Refinements to the project design

Refinements to the project design have been made to minimise potential ground movement and groundwater impacts. These include (but are not limited to):

- Altering the horizontal and vertical alignment of the tunnels so that they are located in competent bedrock and dive beneath the palaeochannels (alluvium) where feasible. Examples of where this has occurred include:
  - The palaeochannels in the vicinity of Hawthorne Canal and Johnstons Creek
  - Redesigning the Rozelle interchange so that it is predominantly underground in competent Hawkesbury Sandstone rock, away from the estuarine and alluvial soils and fill of the Rozelle Rail Yards

- Designing a range of different tunnel and tunnel portal cross sections having regard to the various ground conditions likely to be encountered. The indicative tunnel and tunnel portal cross sections are shown in Chapter 5 (Project description) of the EIS
- Reducing the extent of tunnelling within the estuarine and alluvial soils and fill which are more prone to settlement, such as within the palaeochannel underneath the Rozelle Rail Yards. Designing some localised sections of tunnel to be tanked to avoid groundwater ingress where the alignment intercepts alluvial soils and poor quality rock around the Rozelle Rail Yards. The localised sections of tunnel which are assumed to be tanked to avoid groundwater ingress are shown in Appendix T (Technical working paper: Groundwater) of the EIS
- Providing excavation support (retention systems), which act as barriers to groundwater ingress, in areas of fill, soft clay or water saturated soils. Groundwater ingress can cause groundwater drawdown which in turn can cause settlement (see the sections below for further information). Options for retention systems include sheet pile walls, diaphragm walls and secant pile walls. Excavation support has been assumed for construction of cut and cover sections of tunnels within the estuarine and alluvial soils and fill at the Rozelle Rail Yards as shown in Appendix T (Technical working paper: Groundwater) of the EIS.

Potential settlement impacts during construction

For the majority of the proposed alignment the tunnels are located at depths of greater than 35 metres below ground level and within competent bedrock (Hawkesbury Sandstone and Ashfield Shale). At these depths the impact of surface level ground movement is limited. However, there are a number of locations where the tunnels are at shallower depths. There is increased risk of surface settlement at these locations. These shallower areas of tunnelling are generally located in the vicinity of:

- The entry and exit ramps to and from the Wattle Street interchange at Haberfield
- The three sets of tunnel portals for the Rozelle interchange at Rozelle and Lilyfield
- The tunnel portals for the Iron Cove Link at Rozelle
- The entry and exit ramps to and from the St Peters interchange.

Ground movement caused by tunnelling and the associated impacts of the ground movement would most likely occur during the construction timeframe. Ground movement caused by groundwater drawdown would generally occur during the operation of the project and is discussed in the section below.

Settlement alone does not necessarily result in an impact to a building or structure. For example, if a building experiences uniform settlement across the footprint of the building, damage to the building may be unlikely. Damage from settlement is more likely when uneven (differential) settlement occurs under a building which may result in tensile strain or angular distortion in the building. It is for this reason that criteria for tensile strain and angular distortion are included within the settlement criteria for the project (see **Table C12-2**).

A preliminary assessment was carried out to assess the potential for ground movement and angular distortion (from differential settlement) as a result of the project in section 12.3.4 of the EIS. It should be noted that the assessment considers tunnel excavation induced settlement only and not settlement associated with groundwater drawdown (see section below).

The preliminary assessment identified that over the majority of the tunnel alignment predicted ground movement would be less than 20 millimetres which would be consistent with the maximum settlement criteria. There are a number of discrete areas to the north and northwest of the Rozelle Rail Yards, to the north of Campbell Road at St Peters and in the vicinity of Lord Street in Newtown where ground movement above 20 millimetres is predicted. These discrete areas generally coincide with areas of shallower tunnelling and/or where multiple tunnels are located close to each other. They include:

- To the north of Lilyfield Road at Rozelle in the vicinity of Denison Street in an established residential area and Easton Park (open space area) where multiple tunnels are located and settlement in the range 20 to 35 millimetres is predicted
- To the south of Balmain Road at Leichhardt in the vicinity of Cook Street in an established residential area where multiple tunnels are located and settlement in the range 20 to 30 millimetres is predicted

- To the north of Lilyfield Road at Rozelle in the vicinity of the Lamb Street where settlement in the range 20 to 30 millimetres is predicted
- To the north of Campbell Road at St Peters in an established residential area where settlement in the range 20 to 50 millimetres is predicted
- In the area of Lord Street at Newtown in an established residential area close to St Peters railway station where settlement in the range 20 to 35 millimetres is predicted.

For low buildings of two storeys in height or less a settlement criterion of 30 millimetres is applicable. For high buildings of three storeys or more a settlement criterion of 20 millimetres is applicable. For roads a settlement criterion of 40 millimetres is applicable and for open space areas a settlement criterion of 50 millimetres is applicable (see **Table C12-2**).

Preliminary assessment of angular distortion has not identified any areas within the project footprint where the angular distortion is greater than 1 in 500 (gradient of slope). The areas with the highest predicted angular distortion occur in the vicinity of the Wattle Street interchange ramps at Haberfield and the St Peters interchange ramps within Campbell Road at St Peters but in both locations the relevant criteria would be met.

Potential impacts on listed heritage items are assessed in section 20.3 of the EIS. Eight heritage items have the potential to experience a minor adverse heritage impact (meaning the project would either affect only a small part of the item or a distant/small part of the setting of a heritage place) as a result of settlement from tunnelling activities (minor adverse impact) including:

- Semi-detached house at 15 Burt Street, Rozelle
- Semi-detached house at 17 Burt Street, Rozelle
- Smith's Hall at 56 Burt Street, Rozelle
- Corner shop and residence at 67 Denison Street, Rozelle
- Shop and residence at 69 Denison Street, Rozelle
- House 'Rotherhithe Cottage' at 73 Denison Street, Rozelle
- Lilyfield (Catherine Street) Overbridge at Catherine Street, Lilyfield
- St Peters Railway Station Group at King Street, St Peters.

The tunnel would be between 10 to 20 metres below ground surface at these locations. Further information regarding potential settlement impacts to heritage items is provided in **section C20.4.1**. Settlement impacts at the Cragos Flour Mills Site at 1 and 3 Gladstone Street, Newtown, identified in submissions, are not anticipated based on the preliminary settlement assessment for the project.

Settlement contours based on the preliminary assessment of the potential for ground movement are provided for the area around James Street and Francis Street at Leichhardt (see Figure 12-17 of the EIS). The preliminary settlement analysis indicates that there is the potential for settlement (five to 15 millimetres) which is less than the most stringent maximum settlement criterion.

Settlement contours based on the preliminary assessment of the potential for ground movement are provided for the area around the Pyrmont Bridge Road tunnel site (C9) in Figure 12-20 of the EIS. The majority of the adjacent buildings in this location are located outside the indicative settlement contours for the project. There is the potential for minor settlement (five to 10 millimetres) for the area of the buildings located directly adjacent to Parramatta Road which is less than the most stringent maximum settlement criterion.

Settlement contours based on the preliminary assessment of the potential for ground movement are provided for the area above the Inner West subsurface interchange in Figure 12-17 of the EIS. Predicted settlement is highest at around 15 to 25 millimetres for a small area where multiple tunnels are located close to each other below ground east of War Memorial Park. The majority of the properties above the Inner West subsurface interchange would potentially experience settlement within the range of five to 10 millimetres which is less than the most stringent maximum settlement criterion. Management measures to ensure ground movement impacts are managed are discussed in **section C12.5.3** and provided in full in **Chapter E1** (Environmental management measures).

Settlement contours based on the preliminary assessment of the potential for ground movement associated with the Iron Cove Link are shown in Figure 12-19 of the EIS. Predicted settlement is predicted to be less than five millimetres for the service stations located to the southwest of the portals, which is less than the most stringent maximum settlement criteria for sensitive receivers.

Settlement contours based on the preliminary assessment of the potential for ground movement around the St Peters interchange are shown in Figure 12-23 of the EIS. Predicted settlement is highest under the predominantly residential area between the Princes Highway and Barwon Park Road. Properties to the north, near the intersection of Princes Highway and Barwon Park Road including the service station, are predicted to have ground settlement of less than five millimetres, which is less than the most stringent settlement criteria for sensitive receivers, as shown in Figure 12-23 of the EIS. Management measures to ensure ground movement impacts are managed are discussed in **section C12.5.3** and provided in full in **Chapter E1** (Environmental management measures).

Groundwater drawdown and cumulative impacts

Settlement impacts during the operation of a tunnel are typically a result of groundwater drawdown, which occurs over a longer timeframe as opposed to settlement impacts from tunnel construction. Settlement that occurs due to groundwater drawdown is gradual and generally occurs at a slower rate (possibly over years). It can sometimes also be difficult to distinguish from settlement due to changes in soil moisture that may be naturally occurring; or occurring due to another influence; or occurring as a result of seasonal variations which can cause swelling or shrinkage of the soil. The extent of groundwater drawdown often occurs over a wider area beyond the location of the tunnels and results in a wider and shallower settlement trough which is less likely to result in differential settlement (resulting in tensile strain and angular distortion) on buildings and building damage.

Cumulative settlement impacts include the combined impacts of settlement from tunnel excavation induced ground movement and groundwater drawdown. Tunnel excavation induced ground movement is anticipated to be the prevalent mechanism causing ground movement given that the proposed tunnels are primarily located within competent bedrock (Hawkesbury Sandstone and Ashfield Shale).

Changes in soil moisture can result in ground movement and associated damage to buildings and structures. But due to the depth of the groundwater table below the surface in most of the areas around project infrastructure, soil moisture changes are different to, and distinct from, groundwater level changes and would continue to occur regardless of the project and associated groundwater drawdown. Refinements to the design have also been made to minimise potential ground movement and groundwater impacts and these are discussed earlier in this section.

Detailed design phase

In the event that the alignment of the tunnel changes during detailed design, this would result in different settlement impacts to those predicted the EIS. However, the same measures would be implemented to manage potential impacts from settlement.

Further assessment of potential settlement impacts, including numerical modelling, will be undertaken during detailed design. In areas where ground movement in excess of settlement criteria is predicted, an instrumentation and monitoring program to measure settlement, distortion or strain will be implemented. Feasible and reasonable measures will be investigated and implemented to ensure where possible that the predicted settlement is within the criteria. Measures that will be considered may include (but are not limited to):

- Review of the proposed tunnel design including:
  - the depth and alignment of tunnels
  - the proximity of multiple tunnels to each other
  - the proposed tunnel support system
  - the tunnel lining to manage groundwater inflows
- Rationalising the layout of the proposed ventilation tunnels particularly at the Rozelle interchange
- Review of the construction methodology
- Consideration of ground improvement options.

It is anticipated that a combination of the abovementioned options would be sufficient to ensure that ground movement associated with the project is within the relevant settlement criteria at most locations.

Measures to manage potential settlement impacts

Management measures to ensure ground movement impacts are managed are discussed in **section C12.5.3** and provided in full in **Chapter E1** (Environmental management measures). In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified and landowners would not be required to make an insurance claim.

C12.5.3 Settlement mitigation measures

Submitters had queries regarding mitigation measures to address settlement. Specific queries included:

- The mitigation measures that would be included to prevent settlement and how they would they be implemented effectively
- Concern that the EIS does not provide information regarding pre-condition surveys and responsibility for repairs to damage due to settlement
- Question as to whether there would be any government or independent bodies carrying out property inspections in the vicinity of Rozelle prior to the commencement of construction
- Questions about what has informed the property condition survey 50 metre boundary distance; from tunnel alignment or surface construction; in relation to potential reimbursement for damage
- Concern that the EIS does not provide sufficient information regarding how and when damage caused by settlement would be repaired and how damage claims would be settled
- Without provision for full compensation for damage there would be no incentive for contractors or Roads and Maritime to minimise property damage due to ground settlement
- Concern that residents affected by subsidence will not be adequately compensated
- Concern that settlement will occur over the operational life of the project but no operational Settlement Monitoring Program was included in the EIS
- An independently prepared dilapidation report should be performed on affected houses.

Response

Ground settlement will be managed to comply with the accepted settlement, angular distortion and limiting tensile strain criteria (see **Table C12-2**) wherever possible. Prior to and during construction a range of management measures (see **Chapter E1** (Environmental management measures) would be implemented to ensure that ground movement impacts are managed including:

- Further assessment of potential settlement impacts, including numerical modelling, will be undertaken during detailed design. In areas where ground movement in excess of settlement criteria is predicted, an instrumentation and monitoring program to measure settlement, distortion or strain will be implemented. Feasible and reasonable measures will be investigated and implemented to ensure where possible that the predicted settlement is within the criteria. Measures that will be considered are outlined **in section C12.5.2**
- A Settlement Monitoring Program will be prepared that will provide details on:
  - Settlement criteria and predictions
  - Location of monitoring points
  - Duration of monitoring
  - Data collection (type and method)
  - Triggers and corrective actions that will be implemented if, based on monitoring results, actual settlement is likely to exceed predictions or the relevant criteria, with the aim of complying with the criteria

- The Settlement Monitoring Program will be endorsed the Independent Property Impact Assessment Panel (see below) prior to the commencement of any construction activities with the potential to result in settlement, as determined by the panel, unless otherwise agreed to by the Secretary
- Settlement monitoring will be carried out in accordance with the Settlement Monitoring Program for the period starting prior to commencement of works with the potential to result in ground movement and settlement through to until all settlement has stabilised following completion of tunnel construction. The results of settlement monitoring will be compared to predicted settlement. The implementation and adequacy of the Settlement Monitoring Program will be monitored by the Independent Property Impact Assessment Panel
- Building condition surveys will be offered to landowners within the zone of influence of tunnel settlement (within 50 metres from the outer edges of the tunnels and within 50 metres of surface works) or as otherwise directed by the Independent Property Impact Assessment Panel). Building condition surveys of properties will be carried out prior to the commencement of any project works in the vicinity that have the potential to result in damage to the properties, as identified by the contractor and confirmed by the Independent Property Impact Assessment Panel. Building condition surveys will be carried out by a structural engineer
- In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified. Any disputes between a property or infrastructure owners regarding damage and rectification will be referred to the Independent Property Impact Assessment Panel for resolution
- An Independent Property Impact Assessment Panel will be established prior to the commencement of works with the potential to result in ground movement and settlement or damage due to vibration. The panel will be responsible for:
  - Independently reviewing the building condition survey process and checking that the reports are adequate to assist with any property damage disputes
  - Resolving any property damage disputes
  - Endorsing the Settlement Monitoring Program and monitoring its implementation and ongoing adequacy

  The panel will include at least one specialist with experience with ground movement and settlement due to excavations
- Interface agreements will be entered into with the owners of infrastructure and utility services likely to be impacted by construction of the project. The agreements will identify as required:
  - Minimum separation distances and appropriate settlement criteria for utility infrastructure
  - Settlement monitoring requirements during construction of the project
  - Contingency actions in the event that settlement limits are exceeded.

Management measures that would be implemented to control groundwater inflows (which influence groundwater drawdown and therefore groundwater movement) during construction and operation are summarised in section 19.5 of the EIS and in **Chapter E1** (Environmental management measures). The 50 metre boundary (from the outer edges of the tunnels) for building condition surveys is representative of the expected worst-case zone of influence of tunnel settlement.

C12.6 Impacts on property

Seven submitters raised concerns about impacts on property access. Refer to section 12.4.8 of the EIS for details of impacts on property access.

C12.6.1 Impacts on property access

Submitters expressed concerns about impacts on property access resulting from street closures. Specific queries included:

- Concerns with the closure of Clubb Street and temporary closure Toelle Street preventing access to residential properties

- Concerns regarding access to commercial properties
- Concerns that construction work will impact upon access to schools and childcare centres
- Concerned with restrictions to vehicle access at the commercial brewery near Pyrmont Bridge Road Tunnel Site (C9) including via Gordon Street
- Concerned that access to King George Park will be disrupted during the construction and operational phase of the project.

Response

The project would not close Toelle Street. The Toelle Street and Callan Street intersections with Victoria Road would generally remain open during construction; however there would be instances where temporary closure of these intersections to traffic would be required to construct the permanent design. These works would be conducted during non-peak times, where practical.

Potential impacts to access for the construction of the project are outlined in Table 6-19 of the EIS. Access to commercial premises, educational facilities and open space would be maintained however the project would require some temporary and permanent road closures which may impact regular travel routes to commercial premises. Gordon Street at Annandale would not be modified for the project.

Clubb Street would be converted into a permanent cul-de-sac. Clubb Street is required to be closed due to the significant differences in relative height between the street and the proposed redeveloped southern carriageway of Victoria Road. Residents wishing to access Clubb Street from Victoria Road could use Toelle Street or Callan Street via Manning Street.

The closure of Clubb Street would require motorists who currently use the left-in, left-out intersection with Victoria Road, to use an alternative route to travel between Clubb Street and Victoria Road. This would slightly increase the number of traffic movements and travel times for motorists on Clubb Street and Byrnes Street. However, the creation of a cul-de-sac at the northern terminus of Clubb Street would provide opportunities for amenity improvements along this street, as through traffic would be eliminated. The existing pedestrian paths along Clubb Street would be integrated with the upgraded east–west active transport network that would be provided along Victoria Road.

Traffic surveys indicate that Toelle Street currently functions as the main access to King George Park and so this would not change. Clubb Street only has a small number of houses and as a result the traffic redirected to other surrounding streets would not be significant.

Since the exhibition of the EIS, it is proposed to relocate the bioretention facility from within the informal car park within King George Park at Rozelle (adjacent to Manning Street) to the eastern abutment of Iron Cove Bridge, adjacent to Victoria Road and within King George Park. Refer to **Chapter D3** (Relocation of the bioretention facility at Rozelle) for further information.

C12.7 Impacts on open space

110 submitters raised concerns about impacts on open space. Refer to section 12.4 of the EIS for details of potential impacts to land uses.

C12.7.1 Acquisition of public land including open space

Submitters expressed concern regarding the need to acquire (temporarily or permanently) public land and in particular public recreation areas. These submissions were opposed to the temporary or permanent acquisition of public recreation areas on the basis that it would restrict or remove the ability of local residents to use these areas.

Specific concerns include:

- Loss of open space at the Darley Road construction site
- Loss of open space at King George Park
- Concern that the removal of Buruwan Park would encroach on valued parkland in the inner west
- Easton Park should not be used during the construction phase of the project
- Objection to loss of open space at Haberfield.

Response

The project would facilitate the creation of up to 10 hectares of new open space at the Rozelle Rail Yards including provisions for new pedestrian and cycle links and connections between Lilyfield and the waterfront. A concept design for these works has been prepared and is, included in Appendix L (Technical working paper: Urban design) of the EIS. The concept design would be refined during the development of UDLPs for the project, which would be prepared based on the detailed design and in accordance with relevant commitments in this EIS. The UDLPs would be prepared in consultation with relevant councils, stakeholders and the community.

About 2.5 hectares of open space at St Peters would also be created (in addition to around 10 hectares created at the Rozelle Rail Yards). This would be in addition to the six hectares of new open space being created as part of the New M5 project at St Peters. Urban design and landscaping works at St Peters would be carried out in accordance with the UDLPs and will be consistent with the New M5 RLMP and the New M5 UDLP for this location.

The project has been designed to minimise the need for acquisition of public land, including areas of public open space. The project design has been refined to avoid impacts to open space at Easton Park, Rozelle and Blackmore Park, Leichhardt (refer to section 4.6.2 of the EIS).

However, given the limited availability of vacant land in and around the project footprint and the objective of minimising acquisition of private property, some public land, including public recreation areas, would be temporarily or permanently acquired.

The Darley Road civil and tunnel site (C4) is currently occupied by a commercial premise on land that is being leased from Transport for NSW. There is no existing open space at the site and the project would not use the nearby Blackmore Park during the construction or operation of the project.

Buruwan Park would be permanently acquired for road infrastructure, primarily to accommodate the realignment of The Crescent. This would be a direct loss of about 0.3 hectares of public open space at Annandale. Buruwan Park currently acts as passive recreation area for the community and as a pedestrian and cyclist walkway that connects Bayview Crescent and The Crescent with the Rozelle Bay Light Rail stop. While the loss of Buruwan Park would have some impact on the local community it would be offset by up to 10 hectares of new open space to be provided at the Rozelle Rail Yards and the improved active transport connections. Overall there would be a significant net benefit for the community.

Concerns regarding the impacts to the existing connectivity provided at Buruwan Park are addressed in **section C13.10**.

Since the exhibition of the EIS, it is proposed to relocate the bioretention facility from within the informal car park within King George Park at Rozelle (adjacent to Manning Street) to the eastern abutment of Iron Cove Bridge, adjacent to Victoria Road and within King George Park.

The design for the widening of Victoria Road at the eastern abutment of Iron Cove Bridge as described in the EIS would permanently impact around 1,494 square metres of King George Park. With the bioretention facility now proposed to be located in this area, the project would permanently impact around 2,259 square metres of King George Park. This area comprises around five per cent of the total area of King George Park, leaving around 42,611 square metres (or around 95 per cent) of King George Park not permanently impacted by the project. During operation, this area would be landscaped and would appear as part of King George Park. See **Chapter D3** (Relocation of the bioretention facility at Rozelle) and **section C12-1** for further detail regarding the relocation of the bioretention facility.

Land at the eastern abutment of Iron Cove Bridge, where the bioretention facility would be located, is Crown land which is under the care and control of Inner West Council and Roads and Maritime. This area contains primarily passive open space and landscaping areas. There are no active open space areas or playground facilities which would be impacted (other than the Bay Run, of which a small section would be diverted during the construction of the project and reinstated on completion of construction). See **Chapter D3** (Relocation of the bioretention facility at Rozelle) and **section C12-1** for further detail regarding the relocation of the bioretention facility.

The project would not require the removal of open space at Haberfield. Based on community feedback and concerns raised in submissions on the EIS, a number of refinements to the construction ancillary facilities at Haberfield and Ashfield have been made to further minimise impacts on the community and sensitive receivers. At the Haberfield civil site, the footprint has been reduced and the site would be used as a civil site only as per the arrangement for the Haberfield civil site (C2b). The C2a option which has a longer footprint would therefore not be used for the construction of the project. This would allow the M4 East UDLP and RLMP in the area around Wattle Street and Walker Avenue at Haberfield to be completed earlier.

Impacts of the project on public recreation areas would be minimised through rehabilitation and landscaping at the completion of construction works. These rehabilitation and landscaping works would be designed and implemented with the aim of enhancing local amenity and public recreational values where possible.

The project would improve the usability and accessibility of existing open spaces by providing improved connectivity between open space areas at Easton Park, Federal/Bicentennial Park and Iron Cove.

Social and economic issues associated with impacts on public land and open spaces are discussed in **Chapter C14** (Social and economic).

C12.8 Future land use development impacts and opportunities

1,220 submitters raised concerns about future land use development impacts and opportunities. Refer to section 12.3 and 12.4 of the EIS for details of potential impacts to land uses.

C12.8.1 Changes to future land use (general)

Submitters raised concerns about potential changes to future land use caused by the project. Specific queries and concerns included:

- The EIS does not outline the mechanism that identifies the future use of acquired properties
- The EIS states that the project would not rezone or consolidate remaining project land however this would not prevent the land being rezoned by the government in the future
- Concerns that residual space will be used for infrastructure projects and not public open space
- Lack of justification for why Roads and Maritime is acquiring privately owned property for the purpose of passive landscaping and not to positively contribute uses such as public recreation and affordable and social housing
- Request for a guarantee that any space marked to be used as public land should be retained as such following construction of the project
- Submitter queried what would happen to residual project land during operational phase of the project
- Concerns that the community would be short-changed with regards to rehabilitation action following construction work
- Recommendation that all construction sites be returned to the community as legacy project land not as residual lands
- Concern that increased traffic caused by the project may require land use changes which would affect property values and amenity
- Concern that the EIS does not adequately address the commitment to urban revitalisation along Parramatta Road
- The EIS should identify residual land now as part of the EIS so as to give certainty to future planning for the area and ensure local councils and community groups can begin to develop plans for local open space
- Construction sites should not be regarded as residual land available for future separate and private development, but only made available for community use

- Residual lands should be delivered to Inner West Council and the NSW Government should fund the maintenance of these lands
- Concern that the land on which the Parramatta Road West civil and tunnel site (C1b) and Parramatta East civil site (C3b) would be located will be repurposed as medium density housing. It should instead be used for parkland after construction.

Response

The project would include the provision of new open space and active transport links within the Rozelle Rail Yards and urban design and landscape works would be carried out adjacent to disturbed areas associated with the Iron Cove Link surface works. Refer to section 13.5.3 of the EIS for further information.

A Social Infrastructure Plan will be prepared for the project that includes details about:

- Measures that will be delivered as part of the project to improve community connectivity in areas affected by the project, including pedestrian and cyclist access
- Community and social facilities, for example open space, that will be delivered or enhanced as part of the project
- Community initiatives and programs that will receive support as part of the project, including the manner in which support will be provided.

The Social Infrastructure Plan will be prepared by a suitably qualified and experienced person in consultation with the community and relevant councils and implemented as part of the project (see environmental management measure OSE8 in **Chapter E1** (Environmental management measures)).

Land required for the construction of the project that is not required for operation would be identified following detailed design and construction planning. This land would either be subject to the relevant UDLP or would become 'remaining project land'. Remaining project land would then be broken down further into:

- Land to be retained for future (separate) road infrastructure projects. Roads and Maritime would seek to minimise the areas of land that would be used for future separate infrastructure projects to government owned land, including land already owned by Roads and Maritime, as far as practicable
- Residual land – land required for the construction of the project that is not required for operation or for future (separate) infrastructure projects.

A flowchart showing the process for identifying the future use of land not required for operational infrastructure is included in **Figure C12-2**.

Land Use and Property

Figure C12-2 Process for identifying the future use of land not required for operational infrastructure

Table C12-3 Indicative summary of land uses at the end of construction

Location	Urban design and landscaping[1]	Remaining project land[2]	
		Retained for future road infrastructure projects	Future separate development and/or use
Wattle Street interchange surface works	As identified in the M4 East UDLP, M4 East RLMP and/or the M4 East Legacy Project	Not applicable at this location	As identified in the M4 East RLMP
Parramatta Road West and East civil and tunnel sites	Not applicable at this location	Not applicable at this location	All land following construction
Darley Road surface works (refer to Figure 13-7 of the EIS)	Adjacent to permanent operational infrastructure	Not applicable at this location	Remaining land not required for permanent operational infrastructure
Rozelle surface works (refer to Figure 13-21 of the EIS)	Adjacent to permanent operational infrastructure Provision of new open space within the Rozelle Rail Yards	Adjacent to The Crescent at Annandale	Not applicable at this location
Iron Cove Link surface works (refer to Figure 13-31 of the EIS)	Adjacent to permanent operational infrastructure South of Victoria Road, between around Springside Street and Byrnes Street at Rozelle Adjacent to disturbed areas within King George Park	Not applicable at this location	Not applicable at this location
Pyrmont Bridge Road tunnel site	Not applicable at this location	Not applicable at this location	All land following construction
St Peters interchange surface works (refer to Figure 13-40 of the EIS)	Adjacent to permanent operational infrastructure Landscaping on the remaining site would be carried out consistent with the New M5 UDLP and conditions of approval	Not applicable at this location	Not applicable at this location

Notes:
1 As outlined in the UDLPs.
2 Subject to the RLMP.

Remaining project land would be identified in the RLMP (see environmental management measure PL3 in **Chapter E1** (Environmental management measures)). The RLMP would be prepared in consultation with the relevant council and would identify (and consider) but not be limited to:

- Identification and illustration of all remaining project land following construction of the project, including the physical location, land use characteristics, size and adjacent land uses
- Identification of feasible uses for remaining project land including justification for the selected use
- Identification of timeframes for implementation of the actions in relation to the identified feasible uses.

Future use would be decided by Roads and Maritime and any future development would be subject to separate development assessment and approval. The project would not rezone or consolidate remaining project land and therefore there would be no changes to land use zoning or existing development controls that would guide future development. The measures and works identified in the UDLPs and RLMP would be delivered by Roads and Maritime. Submissions relating to the social and economic potential benefits and impacts from changes to open space and increased pedestrian and cyclist links are discussed in **Chapter C14** (Social and economic).

The project would impact the timing for the delivery of limited urban design landscape works for the M4 East and New M5 projects. To minimise potential delays to the delivery of M4 East urban design and landscape works at Haberfield, the project would seek to reduce the area of land at the surface that would be used for M4-M5 Link construction. A number of refinements to the construction ancillary facilities at Haberfield and Ashfield have been made to further minimise impacts on the community and sensitive receivers. This includes:

- Wattle Street civil and tunnel site – the area at the surface currently being used as a construction zone for the M4 East project would no longer be used. Construction activities would be limited to the Wattle Street entry and exit ramps
- Haberfield civil site – footprint reduced and site to be used as a civil site only as per the arrangement for the Haberfield civil site (C2b). The C2a option would therefore not be used for the construction of the project. No tunnelling from this site is proposed.

These refinements would allow landscaping and urban design works associated with the M4 East UDLP and RLMP in the area around Wattle Street and Walker Avenue at Haberfield to be carried out at the completion of M4 East construction.

A number of key traffic benefits and improvements are forecast as a result of the project and these are outlined in section 8.8.3 of the EIS. Benefits include reduced traffic, including heavy vehicles, from sections of major arterial roads such as Parramatta Road which would improve amenity and provide opportunities for revitalisation along these key corridors. This would be consistent with the objectives of the *Parramatta Road Corridor Urban Transformation Strategy* (UrbanGrowth NSW 2016).

Where the project would connect to the existing road network, increased congestion is forecast in parts of Mascot, along Frederick Street at Haberfield, Victoria Road north of Iron Cove Bridge, Johnston Street at Annandale and on the Western Distributor. The performance of the road network at a number of these areas would be improved when the proposed future Sydney Gateway and Western Harbour Tunnel and Beaches Link projects are completed. Refer to Chapter 8 (Traffic and transport) of the EIS for further information.

To manage potential performance constraints at the Wattle Street interchange, Roads and Maritime will investigate the implementation of the following in consultation with local councils:

- Queuing and capacity monitoring and management on the Frederick Street/Milton Street corridor
- Managing lane use and utilisation to improve the operation of the corridor.

Roads and Maritime will develop a strategy to ensure appropriate network integration in the areas surrounding the Rozelle interchange. The strategy will include a review of:

- Capacity improvement measures
- The interface with road based public transport on the Western Distributor and Victoria Road in consultation with Transport for NSW
- Project staging options
- Demand management measures.

See environmental management measures OpTT2 and OpTT3 in Chapter E1 (Environmental management measures) respectively.

An assessment of the impact of the project on residential and commercial property values has not been included in the preparation of the EIS given the large number of factors that influence the value of a property. However, Appendix P (Technical working paper: Social and economic) of the EIS recognises that impacts on property values prior to and during construction would be of a temporary nature, and are likely to include uncertainty amongst property owners about property acquisition and the magnitude of potential amenity, accessibility and construction traffic impacts, as well as potential impacts to the perceived value of properties during the construction period.

The long term impact of the project on property values would be influenced by the long term benefits of the project as perceived in the land and property markets, arising from general overall improvements in amenity, including improved air quality, reduced traffic noise and improved road safety on local surface roads as traffic is diverted from the surface road network to the new tunnel. Additional benefits would include improved connectivity and active transport links that would be provided by the new open space at Rozelle.

Potential impacts on amenity associated with changes in forecast traffic demand as a result of the project are discussed further in **section B10.13.2**. Responsibility for the maintenance of remaining project land would be subject to an agreement between Roads and Maritime and relevant stakeholders, including local councils.

C12.8.2 Changes to future land use in the vicinity of the Darley Road motorway operations complex (MOC1)

Submitters raised issues about the permanent substation and water treatment facility proposed at the Darley Road motorway operations complex (MOC1), including:

- Submitters request that the location of the permanent substation and water treatment facility at the Darley Road motorway operations complex (MOC1) are moved north of the proposed site and the remaining project land be used for community purposes such as open space and parkland
- Submitters raised concern that the permanent substation and water treatment facility at the Darley Road motorway operations complex (MOC1) would affect the future land use of the site
- Submitters raised concerns that the site would not be available for community purposes following construction
- Submitter is concerned that permanent facilities would limit the future use of the site, and prevent the opportunity to establish safe and direct access to the Leichhardt North light rail stop.

Submitters provided suggestions for alternative uses on residual land of the Darley Road construction site following construction including:

- High density transit orientated development to incorporate mixed residential/commercial uses with an environmentally friendly design
- Multi-purpose sports stadium
- Bicycle parking and hiring area to encourage active transport
- Open space and parkland
- Parking spaces for the Leichhardt North light rail stop
- Green space or other community space.

Response

The indicative siting of operational project infrastructure has been developed in consideration of maximising areas of land that would be available for potential future development (remaining project land). This has primarily been achieved by optimising the design to co-locate the substation, vehicle parking and water treatment facility in the central/western portion of the site, thereby reducing land-take and leaving the central/eastern portion of the site, which is closer to the Leichhardt North light rail stop, for potential future development.

Around 0.2 hectares of the site is proposed to be used for the Darley Road motorway operations complex (MOC1), with the remainder (around 0.3 hectares) likely to become remaining project land and therefore be subject to the RLMP that will be prepared for the project. This is identified in **Figure C12-3**.

Future development would be determined by Roads and Maritime and would be subject to separate development assessment and approval in accordance with the existing land zoning and the restrictions of the relevant consent authority.

The Darley Road motorway operations complex (MOC1) would be located on land zoned B2 Local Centre under the Leichhardt Local Environmental Plan 2013. The objective of the zone is to provide a range of retail, business, entertainment and community uses that serve the needs of people who live in, work in and visit the local area. The project would not rezone or consolidate remaining project land. The future use of this site would be required to be consistent with the existing land zoning.

The water treatment plant at Darley Road is required to capture and treat groundwater inflows to the mainline tunnels. The configuration and design of this facility would be confirmed during detailed design. The need for a substation at the Darley Road motorway operations complex to manage the intake and distribution of the project's power needs would also be investigated and confirmed during detailed design.

Figure C12-3 Darley Road motorway operations complex (MOC1)

C12.8.4 Changes to future land use in the vicinity of Rozelle West and Rozelle East motorway operations complexes (MOC2/MOC3)

Submitters raised concerns about changes to future land use in the vicinity of the Rozelle West and Rozelle East motorway operations complexes. Specific concerns and queries included:

- Queries on what future development may occur at the Rozelle Rail Yards site
- Submitters suggest that the future land use of the Rozelle Rail Yards should be for public open space
- Concern the proposed parkland in the Rozelle Rail Yards may not be permanent or may not be delivered at all
- Request for open space to provide a range of facilities for the community.

Suggestions that the delivery of the Rozelle Rail Yards recreation area should be carried out in consultation with local council and constructed by and paid for by the proponent and delivery contractors:

- Concern that parkland is not included at the Rozelle Rail Yards which is inconsistent with project information displayed in 2016
- During the establishment of new green active transport links (the proposed Rozelle Rail Yards link) appropriate landscaping should be used
- A submitter requests a guarantee that the proposed 10 hectares of open space in the vicinity of the Rozelle Rail Yards site would be protected
- Submitters suggest that the project would prevent proposed construction of a sports field near The Crescent in the vicinity of the Rozelle West/East motorway operations complexes (MOC2/MOC3) and remove future development opportunities for public recreation
- Submitters suggest that a public transport corridor should be retained in the Rozelle area and that a Rozelle to Balmain rail corridor with rail link options to the Balmain peninsula and the White Bay precincts would be lost
- Concern that the project is not consistent with *The Bays Precinct Transformation Plan*, and that the land at the Rozelle Rail Yards is intended for housing and employment
- Submitters believe that the Rozelle Rail Yards is not a suitable future location for a school or recreation area due to the site being in close proximity to ventilation facilities and tunnel portals
- Submitters requested that Rozelle Rail Yards be handed to the Inner West Council following construction
- A submitter requested that Property NSW (formerly Sydney Harbour Foreshore Authority) should have overarching responsibility for the ongoing management and maintenance of the completed works at Rozelle Rail Yards
- Submitters request that there is an agreement for a management plan for the Rozelle Interchange open space
- The EIS does not identify any operational purpose for the area of land adjacent to Lilyfield Road beyond light vehicle parking.

One submitter was supportive of the project at the Rozelle Rail Yards, noting the potential to provide a social and economic connection between the inner west residential areas to Pyrmont, Ultimo and the Sydney central business district (CBD).

Response

The project would include the provision of new open space within the Rozelle Rail Yards (refer to section 13.5.3 of the EIS). The works that would be carried out at the Rozelle interchange would include (but not be limited to):

- Detailed review and finalisation of the architectural treatment of the motorway operational infrastructure
- Reshaping of the landform at the site around the motorway operational infrastructure
- Provision of pedestrian and cyclist paths and bridges

- Provision of new open space within the Rozelle Rail Yards, including landscape works
- Revegetation and planting, including tree planting, at key locations including:
  - Around motorway operational infrastructure such as the ventilation facility
  - Around the constructed wetland, bioretention swale and the drainage channels
  - Adjacent to pedestrian and cyclist paths
  - Around the perimeter of the Rozelle Rail Yards.

The project would deliver up to 10 hectares of open space at the Rozelle Rail Yards as part of the development of the Rozelle interchange, as committed to by the NSW Government (announced in July 2016). This would be a permanent component of the operational project.

The concept plan for the urban design and landscaping outcome at the Rozelle Rail Yards would be further refined during the development of the relevant UDLP for the site and would have regard to identifying opportunities to deliver outcomes that support and connect existing neighbourhoods. This could include provision of community and social infrastructure such as sporting fields and other active recreational facilities, and would be determined through consultation with relevant stakeholders and the community. The delivery of such facilities does not form part of this project and would be subject to separate environmental assessment and approval.

The process for finalising the urban design and landscaping outcome at the Rozelle Rail Yards would be detailed in the relevant UDLP that would be prepared for the project. The UDLP would be prepared in consultation with relevant councils, stakeholders and the community.

A Social Infrastructure Plan will be prepared for the project that details:

- Measures that will be delivered as part of the project to improve community connectivity in areas affected by the project, including pedestrian and cyclist access
- Community and social facilities, for example open space, that will be delivered or enhanced as part of the project
- Community initiatives and programs that will receive support as part of the project, including the manner in which support will be provided.

The Social Infrastructure Plan will be prepared by a suitably qualified and experienced person in consultation with the community and relevant councils and implemented as part of the project (see environmental management measure OSE8 in **Chapter E1** (Environmental management measures)).

The project would not impact the delivery of the new park at The Crescent at Annandale adjacent to the existing Johnston Creek parklands proposed by City of Sydney Council. This area is outside the project footprint and would not be impacted by the project.

Land use within the Rozelle Rail Yards primarily comprises redundant industrial and transport infrastructure that is being removed as part of a separate site management works project. The area is not considered to be an active public transport corridor. The project would not impact the operation of the Inner West light rail line and would provide improved connectivity to the Rozelle Bay light rail stop.

The longer term intention of the NSW Government to enhance public transport is also in the *Draft Future Transport Strategy, Draft Services and Infrastructure Plan* which are currently on exhibition. In regards to public transport services to Rozelle and surrounds the Plan highlights the already committed Sydney Metro West project which is identified as including a station to service The Bays Precinct. This project is anticipated to be rolled out over a one to 10 year timeframe. Additional initiatives include the provision to investigate the extension of the Inner West Light Rail to TThe Bays Precinct. This is anticipated to occur over a 10 to 20 year timeframe. This demonstrates the commitment of the NSW to delivering public transport to The Bays Precinct and Rozelle areas. Roads and Maritime will continue to consult with Transport for NSW these projects and potential interfaces.

The Bays Precinct Transformation Plan identifies the Rozelle Rail Yards as providing an opportunity for mixed housing as well as public spaces and employment uses. The *Bays Precinct Transformation Plan* also identifies the potential for opportunities provided by the redevelopment of the Rozelle Rail Yards for integration and connection of communities to the north and south through the creation of public open space and improved connections between Lilyfield and the waterfront.

While the project is consistent with *The Bays Precinct Transformation Plan* vision for the creation of new open spaces, provision of new pedestrian and cyclist links, and the acknowledgment of the rail heritage of the area, it is inconsistent with the Plan with respect to the development of the Rozelle Rail Yards for mixed housing and employment uses.

As described in **section C9.12.1**, the air quality impact assessment in the EIS determined that emissions from the project ventilation outlet at Rozelle, even in the regulatory worst case scenarios, would not result in significant changes in local air quality including on residential receptors and sensitive community receptors such as open space, parks, active transport routes and playgrounds. As identified in section 14.4.3 of the EIS, changes to predicted air quality both inside the tunnels and outside in the vicinity of the tunnels would also generally have an unobservable impact on human health or local amenity. Therefore, air quality impacts associated with the operation of the project are considered negligible and open space would be suitable for recreational use. A school is not proposed at the Rozelle site as part of the project.

Responsibility for the maintenance of the open space at the Rozelle Rail Yards would be subject to an agreement between Roads and Maritime and relevant stakeholders, including Inner West Council. The entity responsible for the maintenance of the open space would prepare a plan of management, or similar, for the site.

The area of land adjacent to Lilyfield Road at the Rozelle Rail Yards would be used for light vehicle parking during the construction of the project. During operation, it would comprise part of the open space to be provided at the Rozelle Rail Yards.

The support for the project at the Rozelle Rail Yards is noted.

C12.8.5 Changes to future land use in the vicinity of Iron Cove Link motorway operations complex (MOC4)

Submitters raised concerns about the use of the remaining project land in the vicinity of the Iron Cove Link motorway operations complex. Submissions included:

- Further information was requested regarding remaining project land around the Iron Cove Link portals and on/off ramps along Victoria Road. Concern was expressed that remaining project land may be rezoned for industrial or high rise residential purposes, instead of public open space
- Remaining project land adjacent to Victoria Road between Springside Street and Byrnes Street should be used as sports facilities (basketball, cricket and tennis) in the future and that a generous provision of vegetation is included
- The Victoria Road corridor should be converted to a vegetated green street or biodiversity corridor
- The EIS states that the Iron Cove Link work would facilitate future urban renewal opportunities and amenity benefits for properties along Victoria Road. A submitter disagrees, saying the proposed works, including dive structures, modifications to intersections and associated ancillary facilities, does not equate to an urban renewal opportunity.

Response

The provision of areas of land that would be available for future landscaping and/or community and social infrastructure was considered in the siting of operational project infrastructure at the Iron Cove Link such as the ventilation facilities, tunnel portals and entry and exit ramps.

As part of the project, urban design and landscape works would be carried out adjacent to disturbed areas associated with the Iron Cove Link surface works. The urban design and landscape works would include (but not be limited to):

- Detailed review and finalisation of the architectural treatment of the motorway operational infrastructure
- Reshaping of the landform at the site around the motorway operational infrastructure
- Reinstatement of an improved pedestrian and cyclist path along the southern side of Victoria Road, that would connect to the Bay Run, Iron Cove Bridge and local streets
- Provision of new open space, including landscape works

- Revegetation, including tree planting, at key locations including:
  - Around permanent operational infrastructure such as the ventilation facility
  - Adjacent to pedestrian and cyclist paths
  - Along the southern boundary of the land subject to the UDLP between around Springside Street and Byrnes Street at Rozelle.

The concept plan for the urban design and landscaping outcome around the Iron Cove Link portals and entry and exit ramps along Victoria Road would be further refined during detailed design and would identify opportunities to support and connect existing neighbourhoods, complement and stimulate local economies and provide opportunities for growth across existing and future local business along and around Victoria Road at Rozelle. This could include provision of community and social infrastructure such as passive recreational facilities, outdoor gyms and/or infill residential and would be determined through consultation with relevant stakeholders and the community and would be detailed in UDLPs that would be prepared for the project.

The project would potentially facilitate urban regeneration along Victoria Road, due to forecast traffic reductions along Victoria Road east of the Iron Cove Bridge from the operation of the Iron Cove Link. Targeted development control and land use planning could potentially maximise the potential of redevelopment sites along Victoria Road. A revitalised Victoria Road could present new opportunities for businesses, locals and visitors, while providing strong local pedestrian and cyclist connections between Lilyfield and Rozelle. Revitalisation of sections of Victoria Road outside the project footprint does not form part of the project and would be subject to separate assessment and approval processes.

C12.8.6 Changes to future land use in the vicinity of ventilation facilities

Submitters raised concerns about potential changes to future land use in close proximity to ventilation facilities. Specific queries and concerns included:

- All ventilation outlets should be designed to not hinder/prohibit future development that is required to meet the needs of a growing city
- The EIS proposes planning controls to ensure future development is not adversely impacted by emissions from ventilation outlets for The Bays Precinct.

Response

The project ventilation system has been designed and would be operated so that it will achieve some of the most stringent standards in the world for in-tunnel air quality, and will be effective at maintaining local air quality. An assessment was undertaken to determine the air quality impacts of the project on elevated receivers (elevated by buildings and terrain) (refer to section 9.7.5 of the EIS). The implications of the results of the assessment of elevated receivers relevant to future development can be summarised as follows:

- Future developments to the height of 10 metres should be possible at all locations in the study area based on the assumptions in the assessment (see **section C9.11)**
- The predictions do not indicate the need for any restrictions on future developments to 30 metres height, except in the immediate vicinity of ventilation outlets, in particular at St Peters interchange:
  - The ventilation outlets were predicted not to result in adverse air quality impacts at any existing receptors as there are no existing buildings 30 metres or higher located close to the proposed ventilation facilities at St Peters
  - Planning controls should be developed in the vicinity of St Peters to ensure future developments at heights 10 metres or higher are not adversely impacted by the ventilation outlets. Development of planning controls would need to be supported by detailed modelling addressing all relevant pollutants and averaging periods.

The future development of land (including rezonings) in the vicinity of St Peters that may involve multi-story buildings at heights of 10 metres or higher would need to consider the air dispersion performance of the Campbell Road ventilation facility. Roads and Maritime would assist local councils in determining any relevant land use considerations applicable to future development for inclusion in local environmental plans or development control plans, where required.

See **section C9.11** for a more detailed response community concerns regarding the operational air quality impacts of the ventilation facilities on future development including elevated receivers.

C12.8.7 Changes to future land use in the vicinity of M4 East connections

Submitters raised concerns about the future use and development of land within the project footprint at Haberfield and Ashfield. Submissions included:

- Concern that a site once occupied by the commercial facility at Parramatta Road would be sold and rezoned 'for high density living' post the project construction phase
- Following the completion of construction, Option B at Haberfield would increase the area of private land, adversely impacting local residents
- Option B construction sites should be returned to the community for public use
- Concern that there would be no buffer between the road and residential dwellings for the operation of the project
- Submitter requests a comprehensive plan for future development at the commercial facility at Parramatta Road is submitted and approved by the local government prior to the commencement of the project
- Objection to the delay in urban design and landscape works at Haberfield for the M4 East project as a result of the M4-M5 Link by five or more years
- Whether the Parramatta Road ventilation facility will require additional land for the water supply pumps proposed in the EIS.

Response

Following construction, the Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) would be rehabilitated to generally the existing ground level or as otherwise agreed with Roads and Maritime. Future development would be determined by Roads and Maritime and would be subject to separate development assessment and approval and the restrictions of the relevant consent authority in accordance with the existing land use zoning.

The Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) are located on land zoned B6 Enterprise Corridor under the Ashfield Local Environmental Plan 2013. The objectives of this zone include to promote businesses along main roads and to provide a range of employment uses.

As described in section 12.4.2 of the EIS, as the site is directly adjacent to Parramatta Road, there is potential for the construction of the project to have a short term impact on the realisation of projects that are associated with the *Parramatta Road Corridor Urban Transformation Strategy*. However, given the temporary nature of the construction works, it is not anticipated this would have a long term or significant impact on future development potential of the site. When considering potential reuse opportunities for this land, Roads and Maritime would have regard to the objectives of the *Parramatta Road Corridor Urban Transformation Strategy*.

Based on community feedback and concerns raised in submissions on the EIS, a number of refinements to the construction ancillary facilities at Haberfield and Ashfield have been made to further minimise impacts on the community and sensitive receivers. This includes:

- Wattle Street civil and tunnel site – no surface components (no carpark area, laydown area or site offices). All work would be undertaken below ground with access via the Wattle Street ramps constructed by M4 East project
- Haberfield civil site – footprint reduced and site to be used as a civil site only as per the arrangement for the Haberfield civil site (C2b). The C2a option would therefore not be used for the construction of the project. No tunnelling from this site is proposed. This would allow the M4 East UDLP and RLMP in the area around Wattle Street and Walker Avenue at Haberfield to be completed earlier.

The project would not rezone or consolidate remaining project land and therefore there would be no permanent changes to land use zoning for future development. The land would remain as a buffer between Parramatta Road and nearby residential dwellings.

The project would act as a catalyst for the proposed urban transformation along Parramatta Road through a forecast reduction in traffic east of the M4 East entry and exit ramps (as detailed in Chapter 3 (Strategic context and project need) of the EIS).

Further details on the potential development and/or use of remaining project land at this location would be outlined in the RLMP that will be prepared for the project (see **section C12.8.1**). The RLMP would be prepared in consultation with the relevant council and would identify (and consider), but not be limited to:

- Identification and illustration of all remaining project land, including the location, land use characteristics, size and adjacent land uses
- Identification of feasible uses for remaining project land including justification for the selected use
- Timeframes for implementation of the actions in relation to the identified feasible uses.

The M4-M5 Link would not alter the final urban design and landscape outcomes for the M4 East, but may impact the timing of implementation. The project has been designed to minimise surface property acquisition by using areas that are within the project footprint of the M4 East and New M5 projects, where possible. The delivery of the urban design and landscaping outcome as envisaged for the M4 East project around Haberfield would therefore need to be staged to accommodate use of sections of this land for M4-M5 Link construction. As described above, the reduction in the footprint of the Haberfield civil site would allow the M4 East UDLP and RLMP in the area around Wattle Street and Walker Avenue at Haberfield to be completed earlier.

Additional land would not be required for the installation of additional pumps and associated pipework at the Parramatta Road ventilation facility for the M4-M5 Link water suppression system. These works would be undertaken within land subject to the M4 East project.

C12.8.8 Impact of the tunnels on future residential developments and land use patterns

Submitters raised concern that the construction and operation of the project tunnels would impact potential residential developments and future residential land use patterns noting that the project would disperse residential development.

Specific concerns relating to the impact of the project on future residential development and land use patterns included:

- Concern that the project would impact on the ability to undertake basement developments and medium density developments (ie two to three storey multi dwelling housing)
- Concern that the project would discourage the development of medium density residential properties in close proximity to the motorway and disperse people to the fringes of Sydney
- Concern about the rezoning of residual residential land (in reference to Walker Avenue, Haberfield). Submitter believes that these properties should remain zoned for residential development
- Submitter concerned about the future viability of re-zoning their property to allow construction below ground.

Response

In most cases the project tunnels would not affect the future use of property at the surface (under current local planning controls). Subject to council regulations and approvals, landowners would generally be able to:

- Carry out improvements, such as installing a swimming pool
- Dig deeper foundations for a new building or second storey additions
- Undertake property development.

Refer to the Roads and Maritime fact sheet on property acquisition of subsurface lands dated January 2015 for information regarding subsurface acquisition[5]. Further information is provided in Chapter 12 (Land use and property) of the EIS.

[5] http://www.rms.nsw.gov.au/documents/projects/factsheet-property-acquisition-of-subsurface-lands.pdf

At St Peters, the height of the ventilation outlet is restricted by air safety requirements. The future development of land (including re-zonings) in the vicinity of St Peters that may involve multi-story buildings at heights of 10 metres or higher would need to consider the air dispersion performance of the Campbell Road ventilation facility. Roads and Maritime would assist local councils in determining any relevant land use considerations applicable to future development for inclusion in local environmental plans or development control plans, where required. Similar planning controls would not be required at the areas around the other ventilation outlets for the project at the Rozelle interchange or Iron Cove Link.

Figure 12-1 of the EIS shows the regional land use zoning context of the project, highlighting the existing urbanised environment in which the project would be located. The majority of the project would be located underground in tunnels, along with new surface infrastructure and some changes to existing surface infrastructure including upgrades to the existing surface road network.

The project aims to be consistent with, and support the goals and objectives of, NSW strategic planning and transport infrastructure policies as outlined in section 12.1.2 of the EIS. These strategic plans and policies provide goals and objectives for land use planning within the Sydney metropolitan area, including consideration of the role of transport infrastructure in accommodating the future housing, transport, employment and amenity needs of Sydney's growing population.

The project would assist in meeting the transport needs of a growing Sydney population that already involves trips to dispersed destinations. As part of the WestConnex program of works, the project delivers on the NSW Government's plans to deliver an integrated transport solution, comprising roads and public transport, to address congestion on Sydney's roads.

The project presents opportunities to support Sydney's integrated land use and transport planning objectives by:

- Together with other WestConnex projects, creating motorway connections between key employment hubs and local communities, and providing links to population growth centres at Parramatta and western Sydney
- Providing a new underground motorway link between the M4 East at Haberfield and the New M5 at St Peters to assist in easing congestion on parts of existing north–south and east–west surface roads
- Providing connections between the extended M4 and M5 motorways and supporting connections to the proposed future Sydney Gateway project (via the St Peters interchange), ultimately improving access to Sydney's international gateways at Sydney Airport and Port Botany
- Create opportunities for future urban renewal in precincts adjoining the project, including along Parramatta Road (east of Haberfield) and Victoria Road (between Iron Cove Bridge and The Crescent). The urban design and landscaping works to be implemented as part of the project within the Rozelle Rail Yards and the Iron Cove Link surface works (as described in Chapter 5 (Project description) of the EIS) would assist in creating opportunities for improved connectivity to these possible future urban renewal projects, including improved connectivity and permeability for pedestrians and cyclists to locations such as The Bays Precinct
- Reducing travel times and improving reliability for bus services as well as business, personal and freight journeys
- Upgrading and improving facilities for pedestrians and cyclists including the delivery of active transport links around permanent operational infrastructure. This would include two new bridges over City West Link connecting the communities of Rozelle, Balmain, Lilyfield, Glebe and Annandale, and an upgraded east–west connection between Lilyfield Road, the Rozelle Rail Yards, The Bays Precinct and Anzac Bridge
- Providing connections to the proposed future Western Harbour Tunnel and Beaches Link project to the north (via the Rozelle interchange) and to the proposed future Sydney Gateway project at St Peters (via the St Peters interchange) to assist in improving connectivity in Sydney's transport network. These proposed future projects would be subject to separate assessment and approval.

The opportunities outlined above would present a number of benefits for existing and future residential development in the vicinity of the project through the facilitation of urban renewal, the upgrade and improvement of facilities for pedestrian and cyclists and improvement of wider traffic movement patterns between western Sydney and Sydney Airport and Port Botany (via the St Peters interchange).

The project would not rezone or consolidate remaining project land and therefore there would be no permanent changes to land use zoning for future development. Future development would be subject to relevant planning controls and assessment and approval if required by the relevant planning authority.

Further details on the potential development and/or use of remaining project land at this location would be outlined in the RLMP that will be prepared for the project (see **section C12.8.1**).

In most cases subsurface acquisition would not affect the future use of property at the surface (under current local planning controls). See **section C12.8.8** for further information regarding basement development.

C12.9 Impacts on utilities

407 submitters raised issues regarding proposed utility works during construction. Refer to Chapter 6 (Construction work) and Appendix F (Utilities Management Strategy) of the EIS for a summary of the proposed utility works during construction.

C12.9.1 Impacts on utilities (general)

Submitters raised concerns regarding impacts on utilities during construction work. Specific concerns include:

- Concern that minor utility works will not be covered by the Utilities Management Strategy
- Submitter raised concerns with the detail and proposal for the management of existing utilities
- Submitters questioned if project tunnelling would adversely impact utilities along the proposed tunnel alignment
- Submitter expressed concerns about the potential requirement for major utilities to be relocated
- Concern that the EIS does not mention the main northern sewer which passes under a property on Lamb Street, Lilyfield, where two tunnels are going to be located
- Submitter is concerned that works in the vicinity of Darley Road would pose major risks to utilities in the area and require large-scale and intrusive utilities works
- Submitter is concerned about the impact of tunnelling on the stormwater drainage pipes beneath Easton Park and Denison Street
- Submitter raised concerns that existing services at Parramatta Road, Bland Street and Alt Street for construction Option B would be impacted by the project and that the EIS is incorrect when it says services would not be impacted
- A plan should be established to ensure residents are not interrupted by power or water outages.

Submitters also support the proposal of the Utility Co-ordination Committee and recommend that the details of the committee are provided to the public. Submitters request that the Utility Co-ordination Committee be independent of the design and construction contractor(s) for the project.

Response

A Utilities Management Strategy was developed for the EIS (refer to Appendix F (Utilities Management Strategy) of the EIS). This strategy details the major trunk utility works proposed as part of the project based on the concept design presented in the EIS. Sydney Water sewer mains of 300 millimetres diameter or more are included in the definition of major trunk services (refer to section 2.3 of Appendix F (Utilities Management Strategy) of the EIS).

Major trunk utility works proposed as part of the project are identified in the strategy as these works have the longest lead times and may potentially result in more substantial environmental and community impacts. Other minor utility works are not considered as part of the Utilities Management Strategy. This is consistent with the relevant requirements of the SEARs for the project.

Due to the long lead times associated with major trunk utility works, these works are required to be expedited following the approval of the project to avoid delays to the construction program. Given these utility works would be potentially undertaken prior to the approval of the CEMP for the project and that works may be required outside the project footprint assessed in the EIS, the Utilities Management Strategy is required to provide information in relation to:

- Utility installation, protection, relocations, adjustments and new connections (defined as utility works) which are proposed within the project footprint. These utility works have been assessed as part of the EIS and would be subject to a Utilities Relocation Management Plan, if the works are to be carried out prior to approval of a CEMP, or otherwise would be subject to the CEMP
- Utility works which may be required outside of the project footprint.

This Utilities Management Strategy provides information on the type of utility works likely to occur outside of the project footprint, the areas where this work is likely to occur and the framework for how these utility works would be managed. This includes requirements for stakeholder and community consultation, environmental constraints analysis and environmental risk assessment.

Existing utility services (underground and overhead services) have been identified by:

- Dial-Before-You-Dig data searches
- Review of plans and drawings provided by utility service providers
- Site walkovers
- Use of electronic tracing and ground penetrating radar and
- Surface level survey.

Investigations are continuing in consultation with utility service providers to identify the utility services likely to be impacted by the project.

It is proposed that more detailed investigations would be carried out once further consultation with relevant utility service providers has occurred and once a detailed design for the proposed works is confirmed by the contractor. Utility investigations will also be undertaken at the Rozelle Rail Yards in association with the approved site management works. The process for confirming the detail of the utility works and the measures and plans for managing the environmental impacts of the utility works are outlined in Appendix F (Utilities Management Strategy) of the EIS. The implementation of the Utilities Management Strategy (Appendix F of the EIS) is an environmental management measure for the project (see **Chapter E1** (Environmental management measures)).

A preliminary assessment of potential ground movement impacts to infrastructure including utilities from tunnelling is provided in section 12.3.4 of the EIS. Where necessary, consultation would occur with the relevant utility service provider regarding the utility works which are proposed. This would include establishing appropriate settlement and vibration criteria, carrying out further assessments of potential impacts and monitoring of impacts if required.

The process for the effective management of proposed utility works (including relocations) is described in Chapter 9 of Appendix F (Utilities Management Strategy) of the EIS and includes consultation with all relevant utility service providers about potential utility impacts.

Existing utility services in areas that would be subject to utility works are identified in Chapter 3 of Appendix F (Utilities Management Strategy) of the EIS. Utilities around Rozelle interchange in the suburbs of Rozelle and Lilyfield are identified in Table 3-4 of Appendix F (Utilities Management Strategy) of the EIS. This includes a 150 millimetre gravity sewer running east from Lilyfield Road near Easton Park through part of the Rozelle Rail Yards as queried by a submitter. Utilities that would not be impacted by the project would not be required to be directly protected, relocated, or adjusted.

Proposed utility works at Darley Road are described in section 3.3.1 of Appendix F (Utilities Management Strategy) of the EIS. It is anticipated that utility works would be able to be effectively managed at this location through the implementation of the Utilities Management Strategy.

For the two construction sites located on Parramatta Road (C1b and C3b), the existing utility services in this area include Sydney Water sewer and water mains, Telstra communications cables and Ausgrid transmission cables in Parramatta Road, Bland Street and Alt Street. The vertical alignment of the M4-M5 Link tunnels has been adjusted so that the tunnels are at sufficient depth to avoid existing utility services in this area, including Sydney Water sewer and water mains, council stormwater pipes and Ausgrid transmission cables.

Interface agreements will be entered into with the owners of infrastructure and utility services likely to be impacted by construction of the project. The agreements will likely identify:

- Minimum separation distances and appropriate settlement criteria for utility infrastructure
- Settlement monitoring requirements during construction
- Contingency actions in the event that settlement limits are exceeded.

Environmental management measures to manage potential impacts to utilities are described further in **section C12.12.2**. The implementation of the Utilities Management Strategy is an environmental management measure for the project (see **Chapter E1** (Environmental management measures)).

Temporary disruption to services such as power and water supply may occur during utility works for the project. These impacts can be managed by the proposed management measures identified in the Utilities Management Strategy in Appendix F (Utilities Management Strategy) of the EIS, including preparation of a Communications Plan and providing prior notification to residential, business and other landowners that may be affected.

A Utility Co-ordination Committee will be established to coordinate concurrent works associated with multiple overlapping projects and individual utility works to manage potential cumulative impacts and ensure that appropriate respite is provided for potentially affected residents and other sensitive receivers. Representatives of the relevant utility service providers, local councils and the other major infrastructure projects occurring in proximity to the project would be invited to form the committee.

A Utilities Coordinator would be assigned to the project to ensure that works proposed as part of the project are coordinated with works associated with adjacent works associated with infrastructure and utility works in the vicinity. The Utilities Coordinator would:

- Be responsible for establishing and facilitating the Utility Co-ordination Committee
- Serve as the primary point of contact between the Utility Co-ordination Committee and the project
- Maintain a current register of all utility works required as part of, or generally in the vicinity of, the project
- Monitor project works where potential conflicts with utility service provider works have been identified to ensure the cumulative impacts are being managed
- Investigate complaints related to cumulative impacts associated with the project and utility works or other projects.

C12.9.2 Impacts on water utility infrastructure

Submitters raised concerns regarding the demolition and replacement of water utility infrastructure as part of the construction phase of the project. Specific concerns included:

- Disruptions to water supply due to tunnelling in the proximity of two major Sydney water tunnels in the Newtown area
- Submitters questioned the proximity of tunnelling to major Sydney Water utility services.

Response

The mainline tunnel alignment crosses key Sydney Water utility services including the Pressure Tunnel and the City Tunnel (refer to section 12.3.4 and Figure 12-31 of the EIS). These tunnels supply water to residents of Sydney's eastern and southern suburbs and run from Potts Hill to Waterloo.

The Pressure Tunnel is located at an approximate invert level of reduced level (RL) 35 metres Australian Height Datum (AHD). The M4-M5 Link mainline tunnel alignment passes above the Sydney Water Pressure Tunnel in the vicinity of Enmore Road and King Street at Newtown. In this location, the base of the M4-M5 Link mainline tunnels are located about 12 metres above the obvert level for the Pressure Tunnel. The closest construction/access shaft for the Pressure Tunnel (shaft 14) is around 45 metres from the M4-M5 Link mainline tunnels.

The City Tunnel is located at an approximate invert level of RL 15 metres AHD. The M4-M5 Link mainline tunnel alignment passes below the Sydney Water City Tunnel in the vicinity of Princes Highway and Alice Street at Newtown. In this location, the top of the M4-M5 Link mainline tunnels are located about 11 metres below the invert level for the City Tunnel.

Due to the clearance achieved by the M4-M5 Link tunnel alignment relative to the Sydney Water tunnels, and the favourable geological conditions in the areas where these cross over points occur (competent Hawkesbury Sandstone bedrock), it is expected the Sydney Water assets would not be adversely impacted. Preliminary settlement assessments have predicted that both of the Sydney Water tunnels would experience minimal movement. A detailed assessment would be carried out in consultation with Sydney Water to demonstrate that construction of the M4-M5 Link tunnels would have negligible adverse settlement or vibration impacts on these tunnels.

Extensive consultation with Sydney Water has been undertaken during the development of the concept design for the project and EIS and this consultation would continue during the detailed design phase.

Interface agreements will be entered into with Sydney Water prior to utility works that could impact water supply. The interface agreement would consider:

- Minimum separation distances and appropriate settlement criteria for utility infrastructure
- Settlement monitoring requirements during construction
- Contingency actions in the event that settlement limits are exceeded.

Further discussion of impacts to Sydney Water assets is discussed in the response to Sydney Water's submission in **Chapter B4** (Sydney Water).

C12.10 Overshadowing

Eight submitters raised concerns about the potential overshadowing impacts for the project. Refer to section 12.4.13 of the EIS for details regarding potential overshadowing impacts.

C12.10.1 Overshadowing from the Iron Cove Link ventilation facility and outlet

Submitters raised concerns regarding the overshadowing which would be caused by the Iron Cove Link ventilation facility and outlet on adjacent properties. Specific concerns included that the Iron Cove Link ventilation facility and outlet would cause unacceptable overshadowing to residential properties.

Response

Impacts related to overshadowing are summarised in section 12.4.13 of the EIS and shadow diagrams for operational infrastructure are provided in Appendix M (Shadow diagrams and overshadowing) of the EIS. The shadow diagrams are conservative as they do not consider shadow cast by existing structures.

At the Iron Cove Link motorway operations complex (MOC4), shadows from the ventilation outlet in the middle of Victoria Road would impact on an adjoining residential properties on the west side of Callan Street in the mid-morning. The shadows would be likely to affect habitable rooms and private open space of these properties for up to two hours in the worst-case shadow scenario (21 June) (refer to Drawing 022 of Appendix M (Shadow diagrams and overshadowing) of the EIS).

Shadows from the ventilation facility building would impact on adjoining residential properties on the eastern side of Callan Street in the mid to late morning. The impact is likely to affect habitable rooms and private open space of these properties for up to three hours in the worst-case shadow scenario (21 June). The habitable rooms and private open space of these residential properties are already likely to be impacted by overshadowing from existing buildings and structures along their northern boundary during at least part of this period (refer to Drawing 023 and 024 of Appendix M (Shadow diagrams and overshadowing) of the EIS).

Shadows from the ventilation facility would also impact on a small number of adjoining residential properties on the west side of Springside Street in the mid to late morning and early afternoon. The impact is likely to affect habitable rooms and private open space of these properties for up to five hours. The habitable rooms and private open space are already likely to be impacted by overshadowing from existing buildings and structures along their northern boundary during at least part of this period (refer to Drawing 023 to 026 of Appendix M (Shadow diagrams and overshadowing) of the EIS).

Overall, most residential properties affected by overshadowing from permanent operational components of the project would receive a minimum of three hours of direct sunlight in habitable rooms and in at least 50 per cent of principal private open space between 9.00 am and 3.00 pm on 21 June. The exception to this is the adjoining residential properties on the west side of Springside Street at Rozelle.

Detailed design of the ventilation facility building at the Iron Cove Link motorway operations complex (MOC4) would include consideration of treatments to minimise overshadowing on properties south of Victoria Road. This may include reducing the height of the building and/or increasing building setbacks or recessing the building.

Existing residential properties (and approved residential developments prior to project approval) that are affected by overshadowing from the final detailed design of the project (including any noise mitigation measures) are to receive a minimum of three hours of direct sunlight in habitable rooms and in at least 50 per cent of the principal private open space area between 9.00 am and 3.00 pm on 21 June (see **Chapter E1** (Environmental management measures)). Such properties will be identified for further consideration in a Solar Access and Overshadowing Report which addresses compliance with these requirements:

- Where existing residential development currently receives less than the required amount of solar access, existing access to sunlight during operation should not be unreasonably reduced
- Where affected properties include dwellings held under strata or community title, these requirements must be interpreted in relation to individual units within those properties.

C12.10.2 Overshadowing from the Rozelle ventilation facility and outlets

Submitters raised concerns regarding the overshadowing which will be caused by the Rozelle ventilation facility and outlet on adjacent properties.

Response

There would be no overshadowing impact on residential properties in the residential areas surrounding the Rozelle Rail Yards. The residential properties to the south of the Rozelle Rail Yards are located around 100 metres from Rozelle East motorway operations complex (MOC3) across City West Link, the light rail corridor and Whites Creek. Overshadowing within the Rozelle Rail Yards would occur primarily to the south and would not impact the active open space areas or active transport linkages proposed within the Rozelle Rail Yards.

At the Rozelle West motorway operations complex (MOC2), shadows from the ventilation supply facility, fire pump room/deluge tanks and substation would fall within the Rozelle Rail Yards site. The areas within the site that would be impacted would include the western drainage channel and associated landscape planting areas. There would be no overshadowing impacts on nearby residential properties (refer to Drawing 008 to 0021 of Appendix M (Shadow diagrams and overshadowing) of the EIS).

Shadows from the pedestrian and cyclist bridge structure would predominantly fall within parts of the adjacent road corridor (City West Link), the Inner West Light Rail corridor and vegetated areas between the light rail corridor and the north side of Brenan Street at Annandale. There would be no overshadowing impact on nearby residential properties or areas of public open space.

At the Rozelle East motorway operations complex (MOC3), shadows from the three ventilation outlets and ventilation building would fall primarily within the Rozelle Rail Yards and the City West Link road reserve. The areas within the site impacted by overshadowing would include the tunnel portals to/from the proposed future Western Harbour Tunnel and Beaches Link, the western drainage channel and a limited area of the pedestrian and cyclist bridge.

Shadows from the water treatment facility would fall within the Rozelle Rail Yards, on a driveway and carpark area associated with the water treatment facility and on the northern drainage channel. Shadows from the pedestrian and cyclist bridge structure would predominantly fall within parts of the adjacent road corridors (City West Link and The Crescent) and would also impact on limited sections of the western drainage channel.

C12.11 Cumulative land use and property impacts

435 submitters raised concerns about cumulative land use and property impacts.

C12.11.1 Cumulative impacts of settlement on properties

Submitters queried whether the EIS accounted for cumulative subsidence/settlement impacts with the Sydney Metro tunnel in the areas north and northwest of the Rozelle Rail Yards, to the north of Campbell Road at St Peters, Tempe, Sydenham, Camperdown and in the vicinity of Lord Street at Newtown.

Response

The M4-M5 Link mainline tunnel alignment passes beneath the approved Sydney Metro City and Southwest rail tunnels in the vicinity of Lord Street at Newtown.

At this location it is understood that the Sydney Metro tunnels would be located at a depth of around 20 metres below existing ground level. The Sydney Metro tunnels would be excavated by Tunnel Boring Machine and the two tunnels would each have a diameter of seven metres and a 13.9 metre centre to centre spacing. An eight metre exclusion zone applies around the proposed Sydney Metro tunnels (above, below and to each side of the tunnels). It is understood that the Sydney Metro tunnels are likely to be constructed prior to the M4-M5 Link tunnels. It is unlikely that the magnitude of potential cumulative settlement at any point would be greater than the sum of the potential settlement associated with the individual projects.

Near Lord Street, the M4-M5 Link tunnels (the mainline tunnels connecting to the New M5 and the ramp tunnels connecting to St Peters interchange) are at a depth varying between around 35 and 45 metres below ground level. On this basis, it is considered that there is adequate separation distance provided between the M4-M5 Link mainline tunnels and the Sydney Metro City and Southwest tunnels and the eight metre exclusion zone would not be impacted.

For the M4-M5 Link, ground settlement would be managed to comply with the settlement criteria in **Table C12-1** and environmental management measures summarised in **Chapter E1** (Environmental management measures). For the Sydney Metro City and Southwest ground settlement would be managed to comply the relevant conditions of approval for the project.

Further assessment of potential settlement impacts, including numerical modelling, will be undertaken during detailed design. In areas where ground movement in excess of settlement criteria is predicted, an instrumentation and monitoring program to measure settlement, distortion or strain will be implemented. Feasible and reasonable measures will be investigated and implemented to ensure where possible that the predicted settlement is within the criteria (see section C12.5.2 and environmental management measure PL7 in **Chapter E1** (Environmental management measures) for further information. During detailed design, an assessment would be carried out in consultation with Transport for NSW to establish appropriate technical criteria in relation to settlement and vibration and demonstrate that construction of the M4-M5 Link tunnels would have no adverse impacts on the Sydney Metro City and Southwest tunnels. A settlement monitoring program would also be implemented during construction to validate or reassess the predictions should it be required.

C12.11.2 Cumulative impacts with other projects

Submitters raised concerns regarding cumulative impacts with other projects. Specific queries relate to the cumulative and adverse impacts on properties from utility works associated with the M4-M5 Link project, the M4 East project and the New M5 project.

Response

There is the potential for cumulative impacts associated with the proposed utility works for the project where these works are concurrent or overlap with other utilities works that may be related to either the M4-M5 Link project or other projects such as:

- Other utility works or maintenance works that may be undertaken by utility service providers independent of the M4-M5 Link project
- Construction of other elements of the M4-M5 Link project

- Construction of other stages of WestConnex in particular the M4 East project in the Haberfield/Ashfield area (due for completion in 2019) and the New M5 project in the St Peters area (due for completion in 2020)
- Construction of other projects that may occur in the immediate vicinity of the project footprint particularly in the Rozelle and St Peters areas such as:
  - CBD and South East Light Rail (CSELR) maintenance depot at Lilyfield (due for completion in 2019), and in association with CSELR works at Chalmers Street
  - Site management works at the Rozelle Rail Yards (due for completion in 2018)
  - Proposed future Western Harbour Tunnel and Beaches Link project in the Rozelle area
  - Sydney Metro City and Southwest project in the area near Sydenham Station (due for completion in 2024)
  - Proposed future Sydney Gateway project in the St Peters and Mascot areas.

Potential cumulative impacts are likely to relate to a range of issues but most particularly issues such as traffic, car parking, noise and vibration, land use, air quality and visual amenity.

To ensure that the potential cumulative environmental impacts associated with proposed utility works are effectively managed it is essential that various individual utility works are co-ordinated.

It is proposed that a Utility Co-ordination Committee would be established to ensure better planning for, and coordination of, individual utility works and also to ensure that these works are coordinated with other works being undertaken either as part of the M4-M5 Link project and associated with other projects.

These impacts would be managed by the proposed management measures as detailed in **Chapter E1** (Environmental management measures) including regular communication with proponents of other projects, scheduling of works to minimise potential impacts of overlapping projects and progressively staging work to minimise potential impacts (see environmental management measure C1 in **Chapter E1** (Environmental management measures)).

C12.12 Land use and property environmental management measures

321 submitters raised concerns about land use and property environmental management measures. Refer to **Chapter E1** (Environmental management measures) for details of the land use and property environmental management measures.

C12.12.1 Dilapidation assessments

Submitters requested that dilapidation assessments be carried out by independent dilapidation engineers for properties. Submitters specifically requested that dilapidation assessments be carried out at the following locations:

- Rozelle
- Annandale
- Camperdown.

Response

Building condition surveys will be offered to landowners within the zone of influence of tunnel settlement (within 50 metres from the edges of the tunnels and ramps or as otherwise directed by the Independent Property Impact Assessment Panel) and will be carried out by a structural engineer.

An Independent Property Impact Assessment Panel will be established prior to the commencement of works with the potential to result in ground movement and settlement or damage due to vibration. The panel will be responsible for:

- Independently reviewing the building condition survey process and checking that the reports are adequate to assist with any property damage disputes
- Resolving any property damage disputes

- Endorsing the Settlement Monitoring Program and monitoring its implementation and ongoing adequacy
- The panel will include at least one specialist with experience with ground movement and settlement due to excavations.

In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified. Any disputes between a property or infrastructure owners regarding damage and rectification will be referred to the Independent Property Impact Assessment Panel.

C12.12.2 Mitigation of risks relating to property damage

Submitters expressed concern that there is a lack of appropriate mitigation measures to prevent risks relating to property damage from project activities. Submitters requested the inclusion of mitigation measures to prevent risks relating to property damage. Specific measures requested include:

- An action plan is provided to address detrimental effects to property caused by construction
- Measures to prevent damage to Rozelle Public School as a result of the construction works
- More resources allocated to compliance monitoring, including independent regulators which capacity to act
- Ongoing operational monitoring for property damage
- All streets affected by works should be resurfaced at the cost of the developer at the conclusion of construction
- Compensation should be provided where settlement causes property damage.

Submitters raised concern that the EIS does not provide mitigation measures to address the risk of ground settlement related to property damage. Specific areas of concern include:

- Areas of shallow tunnelling
- There are no functional management plans to address risks on properties nor any articulated remediation strategy
- There is no transparency regarding who will be liable for mitigation should the settlement criteria be exceeded in practice during construction.

Submitters raised queries regarding the Independent Property Impact Assessment Panel. Specific queries included:

- How will the panel be constituted and will members of the public have input into this?
- Will this panel determine compensation and, if so, by what process?
- If the panel will not determine compensation, who or what will?
- What will the timeframe be for compensation claims cut-off?

Response

The following environmental management measures would be implemented to manage potential property impacts related to construction vibration:

- A Construction Noise and Vibration Management Plan would be prepared for the project which will identify relevant performance criteria in relation vibration and detail monitoring that would be carried out to confirm project performance in relation to noise and vibration performance criteria
- Location and activity specific vibration impact assessments would be undertaken prior to activities with the potential to exceed relevant performance criteria for vibration
- A Blast Management Strategy would be prepared and implemented for the project if blasting is proposed.

Environmental management measures suggested in the submissions have been considered as part of the review of the environmental management measures presented in the EIS and revisions have been made as appropriate. See **Chapter E1** (Environmental management measures) for a full list of the environmental management measures for the project.

The minimisation and rectification of damage to property during the construction of the project due to general construction activities would be responsibility of the design and construction contractor(s) for the project.

The Iron Cove Link civil site (C8) is located around 140 metres west from the nearest boundary of Rozelle Public School on the opposite side of the Victoria Road. Victoria Road and commercial properties are located between the school and the proposed construction facility. A preliminary assessment was carried out as part of the EIS to assess the potential for ground movement and angular distortion as a result of the project. This assessment did not identify potential ground movement impacts to Rozelle Public School.

The assessment of vibration impacts in section 10.3 of the EIS did not identify the potential for cosmetic damage to buildings from vibration for Rozelle Public School (as part of noise catchment area (NCA) 31). Notwithstanding, any property impacts to Rozelle Public School would be managed by the environmental management measures outlined above and as summarised in **Chapter E1** (Environmental management measures).

Measures to manage potential impacts related to construction vehicles would managed as part of a Construction Traffic and Access Management Plan for the project as summarised in **Chapter E1** (Environmental management measures).Disturbance of roads or street pavement by utility works would be appropriately rectified in a timely manner. A road dilapidation report will also be prepared, in consultation with relevant councils and road owners, identifying existing conditions of local roads and mechanisms to repair damage to the road network caused by heavy vehicle movements associated with the project as reflected in environmental management measure TT18 in **Chapter E1** (Environmental management measures).

An Independent Property Impact Assessment Panel will be established prior to the commencement of works with the potential to result in ground movement and settlement or damage due to vibration. The panel will be responsible for:

- Independently reviewing the building condition survey process and checking that the reports are adequate to assist with any property damage disputes
- Resolving any property damage disputes
- Endorsing the Settlement Monitoring Program and monitoring its implementation and ongoing adequacy.

The panel will include at least one specialist with experience with ground movement and settlement due to excavations. As described above, the minimisation and rectification of damage to property during the construction of the project would be the responsibility of the design and construction contractor(s) for the project. In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified in a timely manner.

Measures to manage potential property damage impacts from settlement are described in **section C12.5.3** and provided in full in **Chapter E1** (Environmental management measures).

Building condition surveys will be offered to property owners within the zone of influence of tunnel settlement (50 metres from the outer edge of the tunnels and within 50 metres of surface works) or as otherwise directed by the Independent Property Impact Assessment Panel. Building condition surveys of properties will be carried out prior to the commencement of any project works in the vicinity that have the potential to result in damage to the properties, as identified by the contractor and confirmed by the Independent Property Impact Assessment Panel. Building condition surveys will be carried out by a structural engineer. In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified in a timely manner. See environmental management measures PL10 and PL13 in **Chapter E1** (Environmental management measures).

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C13 Urban design and visual amenity

This chapter addresses issues raised in community submissions associated with the urban design and visual amenity assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 13 (Urban design and visual amenity), Appendix L (Technical working paper: Urban design) and Appendix O (Technical working paper: Landscape and visual impact) of the EIS for further detail on the urban design and visual amenity assessment.

Contents

C13.1 Level and quality of the landscape and visual impact assessment

396 submitters raised concerns about the quality of the landscape and visual impact assessment. Refer to section 13.1 of the EIS for details of the landscape and visual impact assessment methodology.

C13.1.1 Concerns regarding the quality of the landscape and visual impact assessment

Submitters raised concerns about the quality and level of the landscape and visual impact assessment for the project. Specific concerns relate to:

- The level of assessment is flawed and subjective
- The Urban Design and Landscape Plan (UDLP) should be part of the EIS to ensure that it is produced and that it is consistent with what the EIS proposes
- The community has no opportunity to comment on the urban design of the project as they are only concept plans
- The EIS does not justify the project on an urban design basis
- The EIS does not assess the visual impacts of the ventilation outlets on surrounding development
- Easton Park needs to be assessed from a visual design point as it will be dominated by a large ventilation outlet
- The EIS has not conducted an assessment of potential visual impact to residents on Lilyfield Road
- Potential night lighting impacts during construction have not adequately been assessed, including at the Darley Road civil and tunnel site (C4)
- Lighting outcomes for facilities and residual open space should be identified in the EIS so that the lighting impact on sensitive receivers can be assessed
- Increase of light during night hours has not been properly addressed around the Rozelle Rail Yards and The Crescent
- Active transport routes along Victoria Road and Whites Creek are designed indicatively as the construction is still decided upon by the construction contractor
- Artist's impressions of the open space in the EIS are not based on reality and have changed during the development of the project
- There are insufficient proposals for Haberfield/Ashfield and the project does not integrate with other EIS proposals
- The EIS fails to assess existing or potential bicycle routes as part of project
- The proposed active transport infrastructure lacks detail
- Haberfield and surrounding areas of Five Dock and Ashfield have been overlooked with regards to urban design and community connectivity.

Response

Quality of the landscape and visual impact assessment

The EIS, including the landscape character and visual impact assessment provided in Appendix O (Technical working paper: Landscape and visual impact) and the Urban design report provided in Appendix L (Technical working paper: Urban design) of the EIS, was prepared by a team of qualified professionals and is consistent with the key issues identified in the Secretary's Environmental Assessment Requirements (SEARs), which included requirements issued by key government regulatory agencies as well as industry standards and guidelines.

The assessment of landscape character and visual amenity impacts is also consistent with the *Environmental Impact Assessment Practice Note: Guidelines for Landscape Character and Visual Impact Assessment* (NSW Roads and Maritime Services (Roads and Maritime) 2013b). The methodology comprised two components: an urban design process and a landscape character and visual impact assessment.

To assess landscape character impact, landscape character zones (LCZ) were identified in the study area. The landscape character zones are defined as areas of landscape with similar properties or strongly defined spatial qualities that are visually distinct from adjoining areas. LCZs were focused around areas of proposed surface work where permanent operational infrastructure would be located. The desired future character for each of the LCZs was drawn from the objectives and controls/provisions set out in relevant strategic and statutory planning documents, and considered as part of the landscape character impact assessment and the urban design principles developed for the project.

To assess visual impact, existing views were identified based on a range of criteria, including:

- Where there is potential for a significant change between the before and after view
- Where there is potential for a significant adverse visual outcome for sensitive receivers
- Where there is potential for a significant adverse visual outcome to locations of high visual amenity
- Where there is potential for a significant adverse visual outcome to heritage listed items or Heritage Conservation Areas (HCAs)
- Where the view is representative of other similar settings, in which there was potential for a similar adverse outcome, for example, on the character of a streetscape.

Areas where permanent operational infrastructure is proposed have been reviewed against the urban design principles developed for the project, which are outlined in Table 13-2 of the EIS. The outcome of this assessment is provided in Table 13-23 of the EIS.

The visual impact of the ventilation outlets for the project is assessed in section 13.5 of the EIS. Additional discussion regarding the visual impact of the ventilation outlets is provided in **section C13.4.1**.

The method applied to assess landscape character and visual impact comprised a sensitivity analysis of existing landscape zones or views subject to change, and an assessment of the magnitude of change on that zone or view. The method was applied consistently to all landscape character zones and views subject to change.

The landscape character and visual impact ratings presented in the EIS represent the potential impact of the project before the environmental management measures have been applied. Potential landscape character and visual impacts would be reduced by the application of environmental management measures and the implementation of UDLPs, which will be prepared based on the detailed design and in accordance with relevant commitments in the EIS (refer to **section C13.12.1** and **Chapter E1** (Environmental management measures)). The UDLPs will be prepared in consultation with relevant councils, stakeholders and the community.

The EIS, including all detailed technical studies, was reviewed by the NSW Department of Planning and Environment (DP&E) to confirm that it adequately addressed the SEARs prior to being placed on public exhibition. DP&E also commissioned independent technical peer reviews of key technical studies presented in the EIS to inform its assessment of the EIS including Appendix L (Technical working paper: Urban design) and Appendix O (Technical working paper: Landscape and visual impact).

Assessment of visual impacts at Easton Park

The EIS includes consideration of the visual impact to the view looking south from Easton Park to the project in section 13.5.3 of the EIS. While the architecture and design of the ventilation facility building would be designed to minimise visual impacts, the structure may nonetheless be perceived as an out of context element given its purpose, bulk and scale in an open area and subsequent visual prominence. The final architecture and design of the facility would be subject to the UDLP for the Rozelle Rail Yards. Development of the UDLP would include consideration of the key ventilation facility design principles identified in Annexure 2 of Appendix L (Technical working paper: Urban design) of the EIS (see **section C13.4.1** for further detail).

For residents, the ventilation facility (primarily the ventilation outlets as part of the facility at the Rozelle Rail Yards) from this view would be of a high to moderate level of contrast with the existing view, notwithstanding that much of this would comprise new open space. The new open space would be an improvement to this component of the view, which currently consists of a light industrial area.

Measures would be investigated during detailed design to further reduce the height, bulk and scale of ventilation outlets at Rozelle and provide materials/finishes that reduce impacts to sensitive visual receiver locations.

Assessment of visual impacts at Lilyfield Road

The EIS includes consideration of the visual impact to the view looking east along Lilyfield Road at the corner of Foucart Street. The visual impact of the project at this location was assessed as being Moderate for residents and Negligible for motorists. Refer to section 7.2.2 of Appendix O (Technical working paper: Landscape and visual impact) for further information regarding the assessment of visual impacts at this location.

Assessment of night lighting impacts

A broad assessment of the impacts of night lighting during both the construction and operation of the project was undertaken by applying the methodology for assessment of visual impacts described above. Key visual receivers have been individually assessed and include neighbouring residential properties, users of recreational space and motorists in local streets.

A detailed lighting concept would be developed based around the considerations identified in Appendix L (Technical working paper: Urban design) of the EIS, and would be developed in accordance with AS/NZS 1158 Lighting for roads and public spaces, AS 2560 Guide to sports lighting, AS 4282 Control of the obtrusive effects of outdoor lighting, and AS/NZS 60598 – Series Luminaires.

The assessment of night lighting impacts is therefore based on assumptions that have been made with regard to the types and extent of lighting likely to be installed for both the construction and operation phases consistent with applicable guidelines.

An assessment of potential night lighting impacts, including at the Rozelle Rail Yards, The Crescent and Darley Road is provided in section 13.4.2 of the EIS for the construction of the project. Night lighting impacts during the operation of the project are assessed in section 13.5 of the EIS and specifically in section 13.5.3 of the EIS for the Rozelle Rail Yards and The Crescent.

Project concept design

The urban design principles for the project and the landscape and visual impact assessment are based on the concept design for the project. The concept design defines:

- A definition of property acquisition requirements sufficient to allow construction to proceed
- A project footprint, including for construction and operation
- A clear description of the design principles, extent of impacts and impact management requirements
- A sound and clear basis for later development of the detailed design to a standard required to support project delivery.

Should the project be approved, the conditions of approval will require that the M4-M5 Link is constructed generally in accordance with the project as described in the EIS and as amended in the preferred infrastructure report (see **Part D** (Preferred infrastructure report)).

The project would deliver the key connectivity identified in the concept design which is outlined in Table 13-10 of the EIS. The exact alignments and dimensions of active transport links would be subject to the refinements during the development of UDLPs.

The UDLPs would be prepared based on the detailed design and in accordance with relevant commitments in the EIS. The UDLPs would be prepared in consultation with relevant councils, stakeholders and the community. An Urban Design Review Panel (UDRP) will be established to provide advice and guidance regarding the UDLPs. Where an UDLP is required to address heritage matters, the UDRP will include an independent heritage architect. The community and stakeholders will be able to comment on the draft UDLPs during an exhibition period and the feedback will be considered in the final UDLPs.

The UDLPs cannot be finalised at this stage, given that the EIS considered a project concept design. The assessment of a concept design presents the community and stakeholders with an opportunity to consider and provide feedback on the project before the detailed design work for construction of the project is carried out (refer to **section C2.1.2** for further information). Detailed investigations, planning and surveys will be undertaken by design and construction contractor(s) appointed following the determination of the EIS. The UDLPs would build upon the detailed design by the design and construction contractor(s) while providing further opportunity for community and stakeholder consultation.

Artist's impressions

Artist's impressions are provided for key visual receiver locations for general information purposes in Appendix L (Technical working paper: Urban design) and Appendix O (Technical working paper: Landscape and visual impact) of the EIS. Artist's impressions of the open space at the Rozelle interchange represent the concept design for the urban design and landscape works proposed for the area. The design would be refined during the development of UDLPs as outlined above.

Detail regarding the development of the Rozelle interchange design and reasons for changes to the location of operational infrastructure is provided in Chapter 4 (Project development and alternatives) of the EIS.

Urban design integration with other WestConnex projects

Key objectives outlined in the *WestConnex Motorway Urban Design Framework* (Roads and Maritime 2013a) and *Beyond the Pavement: Urban Design Procedures and Design Principles* (Roads and Maritime 2014a) have informed the development of guiding principles for the urban design for the M4-M5 Link. The urban design principles for the project are outlined in Table 13-2 of the EIS and would be developed into detailed designs under UDLPs for the different staged components of the project. These UDLPs would relate to one another and the other stages of WestConnex. The UDLPs will be prepared in consultation with relevant councils, stakeholders and the community and will be exhibited for comment.

Areas where permanent operational infrastructure is proposed have been reviewed against the urban design principles developed for the project. The outcome of this assessment is provided in Table 13-23 of the EIS.

The project does not include urban design or landscape works at the Wattle Street interchange at Haberfield. The design of the Wattle Street interchange has been developed and assessed as part of the M4 East EIS. The approach is detailed in the Draft M4 East UDLP which was publicly exhibited in late 2016. An addendum to the UDLP containing plans for the M4 East eastern and western ventilation facilities was on public exhibition in early 2017.

Once construction of both projects is completed, remaining project land at this location not required for operational infrastructure or subject to landscape works as part of the M4 East project would be rehabilitated and would be subject to the M4 East project's Residual Land Management Plan, UDLPs and/or the M4 East Legacy Project. These plans are currently being prepared by the M4 East project team and would be subject to the consultation requirements and timeframes set out in the M4 East project conditions of approval. The M4-M5 Link would not alter the final urban design and landscape outcomes for the M4 East, but may impact the timing of implementation.

At the St Peters interchange, operational infrastructure for the Campbell Road motorway operations complex (MOC5) would be located above and adjacent to the interchange portals in the northwest corner of the site, consistent with the location originally identified in the EIS and UDLP for the New M5 project. The ventilation facility has been designed to minimise land-take from the St Peters interchange open space areas, to be delivered by the New M5 project. Landscape works and architectural design of M4-M5 Link operational infrastructure at the St Peters interchange would be undertaken in accordance with an UDLP and the urban design principles developed for the project.

Once construction of both projects is completed, remaining project land would be subject to the New M5 project's UDLP, RLMP and applicable conditions of approval. These plans are currently being prepared by the New M5 project team and would be subject to the consultation requirements and timeframes set out in the New M5 project conditions of approval.

Active transport strategy

An active transport strategy has been developed for the project and is provided at Appendix N (Technical working paper: Active transport strategy) of the EIS. The active transport strategy was developed in consultation with stakeholders and through analysis of current and proposed active transport routes and relevant active transport policies and guidelines (see Appendix N (Technical working paper: Active transport strategy) for further information regarding the development of the active transport strategy).

A summary of the proposed connectivity around the Rozelle interchange that would be delivered by the M4-M5 Link and also by other separate projects subject to separate environmental assessment is provided in Table 13-10 of the EIS. Proposed open space and connectivity at the Rozelle interchange is shown in Figure 13-30 of the EIS.

C13.2 Visual impacts during construction

1,026 submitters raised concerns about visual impacts during construction. Refer to section 13.4 of the EIS for details of potential construction impacts.

C13.2.1 Visual impacts during construction (general)

Submitters raised concerns about general visual impacts during construction of the project. Specific concerns relate to:

- The design of the project does not address the negative visual impacts during construction as outlined in the EIS
- The EIS suggests that additional trees may be removed after opening as part of 'post-opening mitigation measures'
- Concern that the project will remove mature street trees and thereby reduce visual amenity
- Investigations should be undertaken in regards to how mature trees can be retained.

Response

Visual impacts of the project during construction would relate primarily to residential receivers and result from building and tree removal, visibility and overshadowing of residences from acoustic sheds, noise walls and hoardings, and visibility of construction activities. The magnitude of these impacts would vary based on the proximity of receivers, duration of the view and the scale and visibility of construction works. These impacts would be mitigated where possible through appropriate siting of infrastructure, considered selection of materials and finishes for sheds and hoarding, and management of light spill.

Receivers with views of construction ancillary facilities and construction activities may include:

- Residents that adjoin and/or have views of the project
- Workers in commercial properties that adjoin and/or have views of the project
- Road users and pedestrians
- Users of recreation areas/reserves with views of the project.

As described in Appendix O (Technical working paper: Landscape and visual impact) of the EIS, the methodology for the landscape character and visual impact assessment considers the location and context of visual receivers.

A summary of the construction visual impacts on representative receiver locations from areas identified by submitters is provided in **Table C13-1**.

Table C13-1 Summary of construction visual impact assessment

Receiver		Sensitivity to change	Magnitude of change	Overall rating
Rozelle civil and tunnel site (C5)				
C5-1	Motorists – City West Link	Moderate	Moderate	Moderate
C5-2	Residents – Foucart Street and Cecily Street	High	High	High
C5-3	Residents – Lilyfield Road near Denison Street	High	High	High
C5-4	Residents – Breillat Street	Moderate	Low	Moderate–Low
C5-5	Recreational users – Easton Park	Moderate	High	High–Moderate
C5-6	Recreational users – Glebe Foreshore Parklands	High	Moderate	High–Moderate
The Crescent civil site (C6)				
C6-1	Residents – Bayview Crescent and Johnston Street	High	High	High
C6-2	Motorists – The Crescent	Low	Moderate	Moderate–Low
C6-3	Recreational users – Rozelle Bay	Moderate	Moderate	Moderate
C6-4	Recreational users – Glebe Foreshore Parklands	High	Moderate	High–Moderate
Victoria Road civil site (C7)				
C7-1	Residents – Lilyfield Road	Moderate	Moderate	Moderate
C7-2	Residents – Hornsey Street and Quirk Street	High	High	High
C7-3	Motorists – Victoria Road	Low	Low	Low
Iron Cove Link civil site (C8)				
C8-1	Recreational users – King George Park	Moderate	Moderate	Moderate
C8-2	Pedestrians – footpath across Iron Cove bridge	Low	High	Moderate
C8-3	Pedestrians – footpath near Byrnes Street	Low	Moderate	Moderate–Low
C8-4	Residents – Callan Street, Springside Street, Toelle Street and Clubb Street	High	High	High
C8-5	Residents – Nagurra Place, Terry Street and Victoria Road	Moderate	Moderate	Moderate
C8-6	Motorists – Victoria Road	Low	Moderate	Moderate–Low

Environmental management measures to manage visual impacts during construction are summarised in **Chapter E1** (Environmental management measures) and include:

- Ancillary facilities, including the locations of visible structures and plant and perimeter fencing and treatments, will be developed to minimise visual impacts for adjacent receivers where feasible and reasonable. Measures to minimise visual impacts for adjacent receivers will be implemented progressively during the site establishment phase (see environmental management measure LV1)
- Site lighting will be designed to minimise glare issues and light spillage in adjoining properties and will be generally consistent with the requirements of Australian Standard 4282-1997 Control of the obtrusive effects of outdoor lighting (see environmental management measure LV2)
- Regular maintenance of site hoarding and perimeter site areas will be undertaken, including the prompt removal of graffiti and litter (see environmental management measure LV3)
- Construction worksites and construction ancillary facilities will be established in such a manner as to minimise the need to remove screening vegetation wherever practicable (see environmental management measure LV4)
- Hoardings and temporary noise walls will be erected as early as possible within the site establishment phase to provide visual screening (see environmental management measure LV5)
- Acoustic sheds will be designed to be visually recessive and minimise potential overshadowing impacts where possible (see environmental management measure LV6).

Measures to manage potential visual impacts would be implemented during the construction of the project. If required, trees would be removed during the construction of the project and not during project operation.

Impacts to trees and other vegetation

The visual impact of the removal of trees and other vegetation was considered as part of the assessment of visual impacts during construction and is summarised in section 13.4 of the EIS and provided in full in section 6 of Appendix O (Technical working paper: Landscape and visual impact) of the EIS. The project has been designed to minimise the requirement for vegetation clearing where possible and the arboricultural assessment provided at Annexure G of Appendix S (Technical working paper: Biodiversity) of the EIS makes recommendations for tree protection to ensure that impacts of the project on trees are minimised following the hierarchy of avoid, minimise and mitigate.

Trees would be removed during the construction of the project. Additional tree removal not assessed in the EIS would be subject to separate environmental assessment.

The arboricultural assessment in Appendix S (Technical working paper: Biodiversity) of the EIS provided a number of recommendations for tree protection to ensure that impacts of the project on trees are minimised following the hierarchy of avoid, minimise and mitigate, as follows:

- A Construction Flora and Fauna Management Plan (CFFMP) will be developed and implemented during construction. The CFFMP will include measures to manage potential impacts to trees, including:
  - The establishment of tree protection zones (TPZs)
  - Ground protection measures for trees to be retained
- As many trees as possible will be retained during construction. In the event that tree removal cannot be avoided, a tree replacement strategy will be prepared. Replacement trees will be included in the UDLP to be developed and implemented for the project
- The CFFMP will include tree management protocols and provision for the development of tree management plans (in accordance with the requirements of AS 4970-2009) where required for specific trees. Protection of trees within and adjacent to the project areas will be carried out in consultation with an arborist with a minimum Australian Qualifications Framework (AQF) Level 5 qualification in arboriculture for each tree proposed for retention where works associated with the project have the potential to impact on the tree root zone
- Pruning and maintenance work will be carried out by an arborist with a minimum AQF Level 3 qualification in accordance with *AS 4373-2007 Pruning of Amenity Trees* and the NSW

WorkCover Code of Practice for the Amenity Tree Industry (1998) and advice provided by an arborist with a minimum AQF Level 5 qualification in Arboriculture (or equivalent).

The detailed design and construction of the M4-M5 Link project would be managed to ensure that, as far as possible, the identified landscape and visual impacts are minimised and amenity is improved once the project is complete. This would be achieved through the implementation of a range of general and specific measures, including the implementation of UDLPs. A landscape character and visual impact mitigation strategy is included in Appendix O (Technical working paper: Landscape and visual impact) of the EIS which includes the following objectives regarding trees:

- Provide street-tree planting for screening and shade, and mixed sizing of planting where stratification of the canopy is desired
- Improve open space to offset additional infrastructure, eg provision of street trees to adjoining local streets affected by the project.

The landscape character and visual impact mitigation strategy recommends specific design measures to manage the visual impact from the removal of trees including:

- At the Rozelle interchange, integrate the new open space at Rozelle with the Lilyfield Road streetscape through considered street tree planting and associated landscape works in accordance with the Austroads guidelines (see environmental management measure LV13 in **Chapter E1** (Environmental management measures))
- At The Crescent, investigate measures to retain the mature trees of high retention value adjacent to the light rail corridor at the corner of The Crescent and City West Link, and to provide screen planting alongside the retaining wall edge of the light rail corridor, to minimise landscape and visual impacts. Implement options where feasible and reasonable with consideration of site constraints. (see environmental management measure LV18 in **Chapter E1** (Environmental management measures)).

Environmental management measure B6 (see **Chapter E1** (Environmental management measures)) identifies that as many trees as possible will be retained during construction. In the event that tree removal cannot be avoided, a tree replacement strategy will be prepared. Replacement trees will be included in the relevant UDLPs for the project. Opportunities for the provision of replacement trees outside the project boundary will be investigated in consultation with local councils. Additional environmental management measures for the potential retention, protection, removal and replacement of trees are provided in full in **Chapter E1** (Environmental management measures).

C13.2.2 Visual impacts during construction (specific locations)

Submitters raised concerns about visual impacts at specific locations during construction. Concerns relate to:

- Removal of additional trees at Haberfield
- Requests that the mature trees on Darley Road be preserved. Submitters also suggest that a condition of approval include that if any of these trees are removed during construction, that they are replaced with mature trees at the conclusion of the construction at the site
- The mature trees on the north of the Darley Road civil and tunnel site should not be removed as they act as a visual screen for residents from City West Link traffic
- Visual impacts to Easton Park due to the construction of ventilation facilities at the Rozelle civil and tunnel site (C5)
- All mature trees in Easton Park should be retained and maintained during construction
- Concern about the removal of trees, bushes and vegetation around the general Rozelle area and specifically at and around the Rozelle Rail Yards adjacent roads Construction works impacting the visual appeal of the general Rozelle area
- Visual impact of construction site hoarding at The Crescent civil site (C6) would impact on residential views of Rozelle Bay
- Removal of trees near City West Link at Buruwan Park as they provide visual barriers for residents, and would provide screening of the ventilation outlets, suggesting if removed they should be replaced by mature trees

- Visual impacts for residents on Pyrmont Bridge Road near the Pyrmont Bridge Road tunnel site (C9) are High-Moderate in the EIS
- Visual impact of the removal of trees around the St Peters interchange
- Construction works proposed at Waratah Street at Haberfield are inconsistent with the single storey residential character of the street.

Response

Construction visual impacts are described in full at Chapter 6 of Appendix O (Technical working paper: Landscape and visual impact) of the EIS.

The project footprint was developed to avoid and/or minimise impacts to neighbouring sensitive receivers and the removal of vegetation and open space where possible. Opportunities to further reduce the footprint and reduce the extent of impacts would be considered during detailed design.

The environmental management measures for the project include the provision to retain as many trees as possible during construction (see **Chapter E1** (Environmental management measures)). See **section C13.2.1** for further information regarding the management of potential impacts to trees.

Planting of mature and semi-mature trees will be considered for the project. Not all species of trees are conducive to transplanting and this will be considered when developing plans to provide street trees as part of landscaping works. The project will aim to use tree species that will eventually provide appropriate levels of screening. All planting of vegetation within streets would be in accordance with Austroads guidelines.

Haberfield/Ashfield construction ancillary facilities

The Option A construction ancillary facilities at Haberfield/Ashfield would not require the removal of trees for the project as these sites would be located on land previously cleared by the M4 East project.

For the Option B construction ancillary facilities, the Parramatta Road West civil and tunnel site (C1b) would potentially require the removal of 19 trees which are a mix of native and exotic species. However, 17 of these trees would be investigated for retention. At the Parramatta Road East civil site (C3b), seven trees would be removed for the project. See **section C13.2.1** for further information regarding the management of potential impacts to trees.

Construction works are not proposed on Waratah Street at Haberfield for the project.

Darley Road civil and tunnel site (C4)

As identified in Appendix S (Technical working paper: Biodiversity) of the EIS, four high retention value trees were identified at the eastern extent of the Darley Road motorway operations complex (MOC1) site. Opportunities to retain high retention value trees will be explored during detailed design and tree sensitive construction techniques will be considered. Compensatory planting will be considered for trees that cannot be retained as a result of the works. Replacement trees will be planted within, or in close proximity to the project footprint at the completion of the construction of the project. Options would be investigated in the UDLP for planting of vegetation to screen residents on the southern side of Darley Road from the Darley Road motorway operations complex.

The landscape works (including compensatory planting) and architectural design of operational infrastructure at Darley Road will be undertaken in accordance with a project UDLP for the site and the urban design principles developed for the project, as outlined in Table 13-2 of the EIS. The UDLP will be prepared prior to the commencement of permanent built surface and/or landscape works and would present an integrated urban design for the project, consistent with the projects urban design principles (refer to section 13.2.2 of the EIS). The community and stakeholders will be able to comment on the draft UDLP during an exhibition period and the feedback will be considered in the final UDLP.

An objective of the key urban design and landscape principles proposed for the motorway operations complex would include that the scale of built form respects the existing landscape character by using construction materials that are sympathetic to the quality of the local area, and providing landscape work around the motorway operations complex. The remainder of the Darley Road site would be remaining project land and rehabilitated for future development or use in accordance with the RLMP (see environmental management measure PL3 in **Chapter E1** (Environmental management measures)).

Rozelle civil and tunnel site (C5)

Recreational users of Easton Park were identified as having an overall construction visual impact rating of High-Moderate. Specific environmental management measures (see **Chapter E1** (Environmental management measures)) that will be implemented to manage this impact include:

- Investigate measures to minimise view impacts of the project to sensitive residential receptors in the vicinity of the Rozelle Rail Yards as described in this assessment and include in the relevant UDLP where reasonable and feasible (see environmental management measure LV15)
- Develop a design that aims to incorporate the ventilation outlets at the Rozelle Rail Yards as an integral component of the larger open space composition, with reference and consideration to the Ventilation Facility Design Review (refer to Annexure 2 of Appendix L (Technical working paper: Urban design) of the EIS). See environmental management measure LV16 in **Chapter E1** (Environmental management measures).

Construction works, including the removal of trees at the Rozelle civil and tunnel site (C5) has been considered in the assessment of visual impacts in section 13.4.1 of the EIS and section 7.2.2 of Appendix O (Technical working paper: Landscape and visual impact) of the EIS. A separate project (the Rozelle Rail Yards site management works) will have cleared vegetation within the Rozelle Rail Yards boundary including alongside City West Link that provides intermittent screening of the site.

Impacts to trees would be managed in accordance with the measures described in **section C13.2.1**. Revegetation and planting, including tree planting, would be undertaken at key locations as part of urban design and landscape works at the Rozelle interchange including:

- Around motorway operational infrastructure such as the ventilation facility
- Around the constructed wetland, bioretention swale and the drainage channels
- Adjacent to pedestrian and cyclist paths
- Around the perimeter of the Rozelle Rail Yards.

Vegetation within the new open space created by the Rozelle interchange may eventually screen some of the view from Easton Park.

Refer to **section C13.2.1** for further discussion regarding impacts to trees for the construction of the project.

The Crescent civil site (C6)

The residential receivers at Bayview Crescent and Johnston Street near The Crescent civil site (C6) were identified as having a construction visual impact rating of High.

The project would require the removal of Buruwan Park and all of the adjacent vegetation between Whites Creek and City West Link to facilitate the realignment of The Crescent. During construction, the residential receivers at the southern end of Bayview Crescent and Johnston Street would have clear views across the light rail corridor and The Crescent to the construction site. These impacts would be mitigated where possible through appropriate siting of infrastructure and considered selection of materials and finishes for sheds and hoarding.

Upon completion of the construction of the project, the view from residential receivers would include views to City West Link, the land bridge crossing of City West Link, pedestrian bridge crossing of The Crescent and the ventilation outlets at the Rozelle Rail Yards. However, it would also open up views to Rozelle Bay, Balmain industrial area and White Bay Power Station, and the city skyline, which were not previously available.

The landscape character and visual impact mitigation strategy included in Appendix O (Technical working paper: Landscape and visual impact) of the EIS includes that measures be investigated to retain the mature trees of high retention value adjacent to the light rail corridor at the corner of The Crescent and City West Link, or provide plant screening vegetation alongside the retaining wall edge of the light rail corridor, to minimise landscape and visual impacts.

Pyrmont Bridge Road tunnel site (C9)

As identified in section 13.4.1 of the EIS, residents at around the Pyrmont Bridge Road tunnel site (C9) would experience High-Moderate visual impacts associated with construction activities at the Pyrmont Bridge Road tunnel site (C9). While these residents are in close proximity to the construction site and would potentially have views to it from within the residences, the current commercial/industrial land uses and frontage to busy Pyrmont Bridge Road comprises a landscape of relatively low amenity.

The extent of visibility of the construction site, ancillary works and construction traffic would be high and would be in close proximity to residences. The demolition of the warehouse building (as well as others adjoining it), construction of an acoustic shed, and the presence of temporary noise barriers, fences and hoarding would comprise a contrasting view to the existing view. This infrastructure would be removed at the end of construction.

Campbell Road civil and tunnel site (C10)

The Campbell Road civil and tunnel site (C10) would use land on the surface that is being used as a construction site for the New M5 project and would not require the removal of trees at or around the site. Visual impacts associated with the Campbell Road civil and tunnel site (C10) are assessed in section 13.4.1 of the EIS, while visual impacts associated with the removal of trees for the New M5 project were assessed in the New M5 EIS. The landscape works and architectural design of operational infrastructure at the St Peters interchange would be undertaken in accordance with a UDLP. The UDLP would be prepared in consideration of the UDLP for the New M5 project at this location and would seek to provide a consistent urban design for this area.

Once construction of both projects is completed, remaining project land would be subject to the New M5 project's UDLP, RLMP and other applicable conditions of approval. These plans are currently being prepared and would be subject to the consultation requirements and timeframes set out in the New M5 project conditions of approval. The New M5 UDLP will identify landscaping and tree planting measures to be undertaken at the site.

C13.2.3 Lighting from construction ancillary facilities, vehicles and equipment (general)

Submitters raised concerns about impacts from lighting of construction ancillary facilities, vehicles and equipment. Specific concerns included:

- Impacts to sleep from increased light illumination during construction outside of standard day time construction hours
- Rozelle Rail Yards and The Crescent will have an increase in light during the night hours from the construction sites
- Submitter requests that impacted residences should be provided an appropriate solution to ensure low level impacts from night lighting
- Lighting pollution during construction at the Pyrmont Bridge Road construction site.

Response

A landscape and visual impact assessment was undertaken for the EIS (refer to Appendix O (Technical working paper: Landscape and visual impact) of the EIS). As part of the assessment night lighting impacts were identified for each of the construction ancillary facilities. Potential night lighting impacts on receivers at representative receiver locations for each construction ancillary facility are summarised in Table 13-6 of the EIS.

One residential receiver location (containing a number of residences) has been identified as having an overall construction lighting impact rating of High:

- Residents along Lilyfield Road near Denison Street in the vicinity of the Rozelle civil and tunnel site (C5).

Two residential receiver locations have been identified as having an overall construction lighting impact rating of High-Moderate:

- Residents along Darley Road, Charles Street, Hubert Street (south of Darley Road), Francis Street (south of Darley Road) and James Street at Leichhardt, south of the Darley Road civil and tunnel site (C4)

- Residents in the terraces on Campbell Road at St Peters, east of the Campbell Road civil and tunnel site (C10).

Remaining receivers have been assessed as being subject to potential Moderate, Low or Negligible lighting impacts during construction of the project. The outcome of the night lighting assessment for specific locations identified by submitters is provided in **Table C13-2**. Further detail regarding the night lighting assessment is provided in section 6 of Appendix O (Technical working paper: Landscape and visual impact) of the EIS.

Table C13-2 Summary of construction night lighting assessment

Receiver		Sensitivity to change	Magnitude of change	Overall rating
Rozelle civil and tunnel site (C5)				
C5-1	Motorists – City West Link	Low	Moderate	Moderate–Low
C5-2	Residents – Foucart Street and Cecily Street	Moderate	Moderate	Moderate
C5-3	Residents – Lilyfield Road near Denison Street	High	High	High
C5-4	Residents – Breillat Street	Low	Low	Low
C5-5	Recreational users – Easton Park	Low	High	Moderate
C5-6	Recreational users – Glebe Foreshore Parklands	Low	Low	Low
Pyrmont Bridge Road tunnel site (C9)				
C9-1	Residents – Pyrmont Bridge Road	Low	Low	Low
C9-2	Residents – Booth Street and Mallett Street	Moderate	Low	Moderate–Low
C9-3	Motorists – Parramatta Road	Low	Low	Low
C9-4	Residents – Parramatta Road	Low	Low	Low

Construction ancillary facility layouts and lighting requirements are indicative and would be confirmed during detailed design. This would include fixed night lighting at sites that involve or support tunnelling activities.

It is anticipated that construction work at The Crescent civil site (C6), the Victoria Road civil site (C7) and the Iron Cove Link civil site (C8) would be carried out predominantly during standard daytime construction hours and therefore impacts from night lighting have not been assessed at these locations. However, although the majority of surface construction would be undertaken during standard working hours, some construction activities would need to be undertaken outside standard construction hours (ie at night). Construction works that might be undertaken outside the recommended standard hours include:

- Utility works
- Surface works to arterial roads, such as Wattle Street, City West Link, The Crescent, Anzac Bridge, Victoria Road, to minimise impacts on peak traffic flows
- The delivery of oversized plant or structures which are determined by authorities and police to be transported at a time which minimises disruption and safety concerns
- Maintenance and repair of public infrastructure where disruption to essential services and/or considerations of worker safety do not allow work within standard hours
- When emergency work is required to avoid the loss of life, damage to property or to prevent environmental harm
- Public infrastructure works that shorten the length of the project and are supported by the affected community

- Works where a justification of the need to operate outside the recommended standard hours is accepted.

Environmental management measure LV2 (see **Chapter E1** (Environmental management measures)) outlines how the impact of lighting from the construction ancillary facilities and access routes will be reduced. This environmental management measure will be applied at all construction ancillary facilities for the project, and includes designing site lighting to minimise glare issues and light spillage at adjoining properties, generally consistent with the requirements of Australian Standards 4282-1997 Control of the obtrusive effects of outdoor lighting. Where feasible and reasonable, ancillary facilities would be developed and established to minimise visual impacts. Glare and light spill from construction ancillary facilities would be minimised through the use of cut-off and directional lighting. Site hoarding would be erected early within the site establishment phase to provide visual screening (where practical).

A Complaints Management System will be in place for the duration of construction and would record any complaints related to night lighting. This system will include the recording of complaints and how the complaint was addressed (within a Complaints Register). A Community Complaints Commissioner, who is an independent specialist, would oversee the system and would follow-up on any complaint where the public is not satisfied with the response. Further information on future consultation with communities and stakeholders is provided in **section A2.5**.

C13.3 Landscape character impacts during operation

267 submitters raised concerns about landscape character impacts during operation. Refer to section 13.5 of the EIS for details of potential operational impacts.

C13.3.1 Landscape character impacts (general)

Submitters raised concerns about impacts to landscape character from the project. Specific concerns included:

- Loss of landscape character
- Impacts to the built fabric of the inner west suburbs
- WestConnex will impact areas of significant character in Sydney.

Response

The concept design presented in the EIS has been developed and refined to avoid or minimise impacts to the character of local areas where possible. These design refinements include:

- Locating the majority of road infrastructure below ground
- Moving the Rozelle interchange mostly underground, reducing visual impacts and facilitating the provision of open space
- Revising the design in the area east of Victoria Road to reduce land take surrounding the White Bay Power Station
- Where feasible, locating ventilation facilities to provide reasonable separation distance to the closest sensitive receivers (at Rozelle, Iron Cove and St Peters)
- Removing the proposed ramps on Parramatta Road at Camperdown (the Camperdown interchange) from the project, avoiding impacts in a heritage sensitive area adjacent to the University of Sydney and Victoria Park.

Landscape character impacts are impacts on the aggregate of an area's built, natural and cultural character or sense of place as defined in the Roads and Maritime *Environmental Impact Assessment Practice Note – Guidelines for Landscape Character and Visual Impact Assessment* (Roads and Maritime 2013b).

The key landscape character impacts of the project relate to sensitive LCZs that are likely to experience a noticeable change in their character as a result of new operational infrastructure or landscape elements. The assessment of potential landscape character impacts detailed in the EIS did not identify any LCZs that would experience landscape character impacts with an overall rating of High (refer to Table 13-11 in Chapter 12 (Urban design and visual amenity) of the EIS). This is due to the project providing additional and upgraded road infrastructure within areas characterised by existing major arterial road corridors.

Site selection for project infrastructure has been based on either vacant or underutilised locations in the inner west where feasible, such as at the currently disused Rozelle Rail Yards. Operational infrastructure for the project would be of a semi-industrial nature which is generally consistent with the varied building types throughout the inner west, which includes a relatively large amount of industrial/semi-industrial buildings and other infrastructure.

UDLPs will be prepared prior to the commencement of permanent built surface and/or landscape works and will present an integrated urban design for the project, consistent with the project urban design principles (refer to section 13.2.2 of the EIS). The community and stakeholders will be able to comment on the draft UDLPs during an exhibition period and the feedback will be considered in the final UDLPs.

C13.3.2 Landscape character impacts (specific locations)

Submitters raised concerns about impacts from the project on landscape character. Specific concerns relate to:

- Concern for the area around Victoria Road due to the proposed Iron Cove Link ventilation outlet, which would be inconsistent with the low rise buildings and streetscape standards of the Balmain and Rozelle community
- Concern that the character of Rozelle will be adversely impacted as a result of the project. The local sense of place needs to be protected and nurtured for future generations
- The M4-M5 Link will degrade the unique inner city Sydney suburb of Rozelle
- Concern for the loss of the local landscape character of the Alexandria area
- Concern for the Leichhardt area due to the proposed Darley Road motorway operations complex (MOC1), including the substation and water treatment plant, being inconsistent with the existing low rise streetscape of the area
- Concern about maintaining the character of the neighbourhood by keeping development complimentary in architectural style, form and materials and preserving the low scale cottage character at Leichhardt.

Response

The operational landscape character of the project was defined through the identification of 33 LCZs. The assessment of LCZs focused on areas where permanent operational facilities are proposed. **Table C13-3** outlines the potential overall impact to LCZs as a result of the project for areas identified by submitters. Refer to section 13.5 of the EIS for further information regarding impacts to landscape character for the project.

Table C13-3 Summary of LCZ assessments

Landscape character zone area	Landscape character zone	Sensitivity to change	Magnitude of change	Overall rating
Central west landscape character zones (Darley Road MOC)	LCZ 1 – Darley Road residential precinct	Low	Low	Low
	LCZ 2 – Darley Road commercial precinct	Moderate	Moderate	Moderate
	LCZ 3 – Leichhardt light rail precinct	Low	Low	Low

Landscape character zone area	Landscape character zone	Sensitivity to change	Magnitude of change	Overall rating
Central east landscape character zones (Rozelle interchange)	LCZ 4 – Glebe Foreshore Parklands precinct	Moderate	Moderate	Moderate
	LCZ 5 – Johnston Street precinct	High	Negligible	Negligible
	LCZ 6 – Annandale Street and Young Street precinct	Moderate	Low	Moderate –Low
	LCZ 7 – Whites Creek Valley precinct	High	Low	Moderate
	LCZ 8 – Catherine Street precinct	Moderate	Negligible	Negligible
	LCZ 9 – Catherine Street neighbourhood centre precinct	Low	Low	Low
	LCZ 10 – Balmain Road precinct	Low	Negligible	Negligible
	LCZ 11 – Nanny Goat Hill residential precinct	Low	Low	Low
	LCZ 12 – Halloran Street commercial precinct	Low	Negligible	Negligible
	LCZ 13 – Easton Park residential precinct	High	Moderate	High– Moderate
	LCZ 14 – Victoria Road south precinct	Low	Moderate	Moderate –Low
	LCZ 15 – White Bay Power Station precinct	High	Moderate	High- Moderate
	LCZ 16 – Rozelle Bay wharves precinct	Low	Moderate	Moderate –Low
	LCZ 17 – City West Link precinct	Low	Moderate	Moderate –Low
	LCZ 18 – Rozelle light rail corridor and Whites Creek canal precinct	Moderate	Moderate	Moderate
Northern landscape character zones (Iron Cove Link)	LCZ 19 – Rozelle Rail Yards precinct	Low	Moderate	Moderate –Low
	LCZ 20 – Victoria Road north precinct	Low	Moderate	Moderate –Low
	LCZ 21 – Victoria Road light industrial precinct	Moderate	Negligible	Negligible
	LCZ 22 – Iron Cove residential precinct	Low	Moderate	Moderate- Low
	LCZ 23 – King George Park precinct	Moderate	Moderate	Moderate
	LCZ 24 – Callan Park residential precinct	High	Moderate	High– Moderate
	LCZ 25 – Sydney College of the Arts precinct	High	Negligible	Negligible

Landscape character zone area	Landscape character zone	Sensitivity to change	Magnitude of change	Overall rating
	LCZ 26 – Darling Street precinct	Low	Negligible	Negligible
Southern landscape character zones (St Peters interchange)	LCZ 27 – Sydney Park precinct	High	Low	Moderate
	LCZ 28 – Sydney Park residential precinct	Moderate	Moderate	Moderate
	LCZ 29 – Alexandra Canal industrial precinct	Low	Negligible	Negligible
	LCZ 30 – Barwon Park precinct	High	Moderate	High–Moderate
	LCZ 31 – Princes Highway precinct	Low	Low	Low
	LCZ 32 – St Peters triangle precinct	Moderate	Negligible	Negligible
	LCZ 33 – St Peters interchange precinct	Negligible	Low	Negligible

Of the 23 landscape character zones at Rozelle around the Rozelle interchange and Iron Cove Link, only three were identified as having a High-Moderate overall landscape character impact rating. This suggests that overall, the character of the area would be maintained and preserved for future generations and would only be subject to High-Moderate impacts at specific locations.

The project would be further refined through the detailed design process. Operational infrastructure would be subject to UDLPs that would be prepared in consultation with the community and relevant stakeholders. Design elements can reasonably be expected to comprise well-considered design elements within the context of both the project footprint and broader road corridor landscape.

A summary of the assessment of potential landscape character impacts on the LCZs identified by submitters is included in the following sections.

LCZ 20 – Victoria Road north precinct

At the Victoria Road north LCZ, the inherent landscape value affected by the project is low, characterised primarily by a mix of later 1900s industrial style buildings, Victorian style two storey shops and residences, and housing from the inter-war years. The LCZ is characterised by high volumes of traffic, with vehicles travelling along Victoria Road, which serves as a main arterial road for the inner west of Sydney.

A number of buildings that front Victoria Road include original shop front detailing and weather protection through the incorporation of cantilevered awnings. A number also have nil setbacks and restricted vehicle access resulting from there being no formal lane structure. The former Balmain Leagues Club site is located near the ridgeline to the northwest of Darling Street and comprises a vacant and derelict building.

The project would have a high level of congruency with the existing arterial corridor in relation to scale and form, notwithstanding the introduction of new portal elements. The ventilation outlet at the Iron Cove Link motorway operations complex (MOC4) comprises an uncharacteristic element in terms of form, scale and mass. However, this element would be viewed within the context of a major widened road corridor landscape.

The project would be further refined during the detailed design process. In particular, the ventilation outlet, ventilation facility building, motorway portals and associated retaining walls, would be subject to a UDLP. As such, these elements can reasonably be expected to comprise well-considered design elements within the context of both the project footprint and broader road corridor landscape.

A detailed review and finalisation of architectural treatment of the project operational infrastructure, including ventilation facilities, will be undertaken during detailed design. The architectural treatment of these facilities would be guided by ventilation facility performance requirements, the outcomes of community consultation and the urban design principles identified in Appendix L (Technical working paper: Urban design) of the EIS.

Landscaping works will be carried out adjacent to disturbed areas, around operational infrastructure (such as ventilation facilities), and in areas of new open space that would be provided at the Rozelle Rail Yards and adjacent to Victoria Road at Rozelle.

LCZ 30 – Barwon Park precinct (St Peters)

The Barwon Park precinct adjoins Sydney Park. This area will have undergone significant change in the landscape context due to the construction of the St Peters interchange and ancillary infrastructure and the widening of Campbell Road as part of the New M5 project. The ventilation facility proposed as part of the M4-M5 Link project (at the Campbell Road motorway operations complex (MOC5)) would contribute to a substantial change in the outlook from, and backdrop to, this primarily residential precinct.

LCZ 1 – Darley Road residential precinct

Landscape character impacts to the Darley Road residential precinct would include the loss of the large 'warehouse' building, revealing an existing retaining wall to the elevated light rail corridor and the addition of a smaller group of project buildings and associated infrastructure (including water treatment plant) in conjunction with low landscaping and street trees to the Darley Road frontage.

The existing large-scale warehouse building and existing trees would be removed and replaced by the water treatment plant of smaller scale. The addition of the motorway operations complex comprising a water treatment plant and associated infrastructure elements would be viewed against the backdrop of the elevated light rail corridor and landscaping of its embankment.

The motorway operations complex building would have a high capacity for absorption within the landscape at this location, given the relationship with the adjoining elevated light rail corridor and City West Link and the separation to the adjacent residential precinct provided by Darley Road. The landscape works (including compensatory planting) and architectural design of operational infrastructure at Darley Road including the water treatment plant and substation (the need for a substation would be confirmed during detailed design) will be undertaken in accordance with a project UDLP.

The detailed design and construction of the M4-M5 Link project would be managed to ensure the identified landscape and visual impacts are minimised by implementation of a range of general and specific measures, as outlined in **Chapter E1** (Environmental management measures).

C13.4 Visual impact during operation

648 submitters raised concerns about visual impacts during operation. Refer to section 13.5 of the EIS for details of potential operational impacts.

C13.4.1 General visual impacts from the project

Submitters raised concern about general visual impacts from the project. Concerns included:

- This project will cause a reduction in visual amenity in the Inner West
- Ventilation outlets (up to 40 metres high) at Iron Cove Link and Rozelle would have visual impacts on surrounding residents
- Visual impacts from concrete roads and interchanges during operation
- The project will result in permanent impacts to views
- Visual impacts from ventilation structures during operation
- Visual impacts from the proposed noise walls
- Impacts to visual amenity in the areas adjacent to the tunnel portals

Response

Visual impacts arising from the project primarily relate to new permanent operational infrastructure, in particular from the ventilation outlets and structures, tunnel portals, and landscape elements impacting on existing views. In particular, ventilation facilities at the Rozelle interchange, Iron Cove Link and St Peters interchange are of contrasting bulk, scale and form when compared to other built form elements within existing views. Key visual receivers subject to high visual impacts include:

- Residential and recreational receivers surrounding Easton Park at Rozelle, which would have open views of the Rozelle ventilation facility and outlets. Vegetation within the new open space created by the Rozelle interchange would eventually screen some of this view
- Recreational receivers at Glebe Foreshore parklands, which would have views across Rozelle Bay and to the Rozelle ventilation facility and outlets. This view would be experienced in the context of other infrastructure visible in the skyline such as Anzac Bridge and the Glebe Island silos
- Residential, pedestrian and light rail patron receivers near the Rozelle Bay light rail stop, who would have new views toward the Rozelle interchange including ventilation outlets, new open space and associated active transport infrastructure. New views towards the city skyline would also be created through the removal of vegetation
- Residential receivers at and around Terry Street at Rozelle, who would experience a change in view associated with the Iron Cove Link ventilation outlet encroaching into the existing, partial view to Callan Park.

Other key visual impacts comprise high view loss at two locations: free-standing dwellings located on Foucart Street near the corner of Lilyfield Road and residences within the vicinity of Hutcheson Street and Denison Street near Lilyfield Road. These dwellings look east across part of the Rozelle Rail Yards, and south across the western part of the Rozelle Rail Yards respectively with views to the city skyline.

While these locations would experience a change in skyline view, there would also be an enhancement of foreground view associated with the new open space and active transport connections through the Rozelle interchange, providing additional community benefits to these areas. For the Iron Cove Link, motorway infrastructure has been integrated within a well-considered streetscape setting, and the ventilation outlet would be located within the centre median of Victoria Road rather than abutting existing residential development.

Visual impacts of the project would be minimised through considered development and implementation of the urban design and landscaping features in accordance with UDLPs that would be developed for the project.

The UDLPs would be prepared in consultation with relevant councils, stakeholders and the community. An Urban Design Review Panel would be established to provide advice and guidance regarding the UDLPs. Urban design and landscape works would include the provision of landscape planting along and around key visible infrastructure such as ventilation facilities and motorway operations complexes. Over time and as this vegetation matures, the benefits provided by landscape planting will improve.

Annexure 1 and Annexure 2 of Appendix L (Technical working paper: Urban design) include a portal design review and ventilation facility design review respectively. The design reviews consider national and international approaches to portal and ventilation facility design and identify strategies to be considered during the detailed design of the operational infrastructure.

Mitigation and design measures proposed for the project to minimise identified visual impacts are outlined in **Chapter E1** (Environmental management measures) and include:

- Integrate the new open space at Rozelle with the Lilyfield Road streetscape through considered street tree planting and associated landscape works in accordance with the Austroad guidelines
- Investigating measures during detailed design to reduce the height, bulk and scale of ventilation outlets at Rozelle, Iron Cove and St Peters, and enhance the landscape setting of the ventilation outlets, subject to achieving desired ventilation outcomes, and in accordance with the design principles detailed in the M4-M5 Link Urban design report

- Consulting with UrbanGrowth NSW regarding the interface between the project footprint and the White Bay Power Station precinct. Design the interface to optimise compatibility between the two areas from a landscaping, visual, heritage and active transport connectivity perspective
- At the St Peters interchange, the UDLP sub-plan for the area adjoining Campbell Road motorway operations complex is to be consistent with the New M5 St Peters Interchange Recreational Area Sub-plan.

Noise walls may be required along/within the vicinity of the southern side of the widened Victoria Road at the Iron Cove Link, ranging between about four metres and five metres high, subject to detailed design. The noise walls are one of a number of noise mitigation options being considered including road pavement treatments and architectural treatments of properties and were therefore not included in the concept design for the project. The visual impacts of the noise walls were therefore not assessed in the EIS. If noise walls are deemed necessary, their location, form and function and potential visual impacts will be considered and assessed during detailed design. The design and treatment of permanent built works will be described in the relevant UDLPs for the project (see environmental management measure UD1 in **Chapter E1** (Environmental management measures)). Consultation will be undertaken with local residents in the event that noise walls are required for the project.

The project generally creates a moderate to low level of visual impacts. This is due in large measure to the following elements which have been incorporated into the concept design through a process of design development which involved gradual refinement to avoid or minimise impacts where possible:

- Locating the majority of the road infrastructure at Rozelle Rail Yards underground, and provision of extensive and well-considered open space above including two major north-south pedestrian/cycle connections over City West Link, linking Lilyfield with Rozelle, and one east-west pedestrian/cycle connection under Victoria Road, with potential for future connection to The Bays Precinct
- The integration of the Iron Cove Link within a well-considered streetscape setting, and locating of the ventilation outlet within the centre median of Victoria Road rather than abutting existing residential development
- Integration of the Campbell Road ventilation facility within the New M5 portals and separation from nearby residences.

C13.4.2 Visual impacts around Darley Road

Submitters raised concern about visual impacts from the project around Darley Road. Concerns included:

- Residents on Darley Road and Hubert Street will have a direct line of sight to the Darley Road motorway operations complex (MOC1) and subsequently a degraded visual environment
- The motorway operations complex, including a permanent water treatment plant and substation on Darley Road, will have a visual impact and it is inconsistent with the character of the neighbourhood of Leichhardt, which comprises of low rise homes
- The Darley Road motorway operations complex (MOC1) will be a prominent feature in the landscape that will impact the landscape character and visual amenity of the area
- Opposition to the 10 to 12 metre high building at Darley Road due to the bulk and scale being inconsistent with the streetscape
- If approved, the Darley Road motorway operation infrastructure should be moved to the north of the site out of line of sight of residents.

Response

An assessment of the visual impacts of the Darley Road motorway operations complex (MOC1) was undertaken in the EIS for areas where built operational infrastructure would be visible (refer to section 13.5.2 of the EIS and the visual envelope mapping in Appendix O (Technical working paper: Landscape and visual impact) of the EIS).

The operational visual impact assessment did not identify the potential for High visual impacts on views for any key viewpoints at the Darley Road motorway operations complex (MOC1). A summary of the operational visual impact assessment is provided in **Table C13-4**. The view to the location where the Darley Road motorway operations complex (MOC1) is proposed from nearby residences is of poor to moderate quality within the context of the refurbished retail warehouse outlet that is currently present at this location.

At the Darley Road motorway operations complex (MOC1), the project would comprise a low scale, architecturally well-considered development. The scale, size and character of the project would be expected to comprise an appropriate level of visual 'fit' with the streetscape, within the context of its infrastructure purpose, including the provision of low perimeter landscape works and street tree planting along the Darley Road frontage of the project. The project would be visually compatible with the adjoining light rail corridor and Charles Street Underbridge. The development would be of a lower height compared to the existing retail warehouse building.

The indicative siting of operational project infrastructure has been developed to maximise areas of land that would be available for potential future development (ie remaining project land). This has primarily been achieved by optimising the design to co-locate facilities at the western end of the site, thereby reducing land-take. The siting of the operational project infrastructure at the western end of the site also allows for the remaining project land component to be located nearest to the Leichhardt North light rail stop, creating opportunities for future integration with the public transport network.

The landscape works and architectural design of operational infrastructure at Darley Road would be undertaken in accordance with a project UDLP and the urban design principles developed for the project (refer to section 13.2.2 of the EIS). The UDLPs would be prepared in consultation with relevant councils, stakeholders and the community. Around 0.2 hectares of the site is proposed to be used for the Darley Road motorway operations complex (MOC1) and would be subject to a UDLP, with the remainder subject to the RLMP that would be prepared for the project (refer to section 12.4.3 of the EIS).

While the project would be visible by motorists travelling north on Hubert Street, views of the project from the residences on Hubert Street would be limited as identified in the visual envelope mapping included in section 7.3.1 of Appendix O (Technical working paper: Landscape and visual impact) of the EIS. Only one residential building on Darley Road faces directly onto Darley Road in the vicinity of the motorway operations complex, with other residential buildings facing onto the streets that run perpendicular to Darley Road (ie Francis Street, Hubert Street and Charles Street).

Table C13-4 Summary of operational visual impact assessment at Darley Road

Receiver location	Receiver type	Sensitivity to change	Magnitude of change	Overall rating
Darley Road				
View looking east from Darley Road near corner of Charles Street (D1)	Residents	Low	Moderate	Moderate–Low
	Pedestrians	Low	Low	Low
View looking west from Darley Road at entry to lane between James Street and Francis Street (D2)	Residents	Low	Low	Low
	Pedestrians	Low	Low	Low

C13.4.3 Visual impacts around the Rozelle interchange

Submitters raised concern about visual impacts from the project around the Rozelle interchange. Concerns included:

- Visual impacts from the realignment of The Crescent, the associated retaining wall and land bridge near the Rozelle Bay light rail stop once trees and vegetation are removed at Buruwan Park
- The project would impact the visual amenity of The Bays Precinct

- Visual impacts on Easton Park from the ventilation facility and re-designed urban environment
- Visual impacts alongside Rozelle Bay, due to the presence of a ventilation facility
- Visual impacts of the ventilation outlets at the Rozelle interchange
- Concern that facilities at the Rozelle interchange would visually isolate the areas of open space
- Measures should be implemented to minimise the visual impact of ventilation facilities, especially at the Rozelle Rail Yards
- Concern the wetland at the Rozelle Rail Yards will be unsightly.

Response

An assessment of the visual impacts of the Rozelle interchange was undertaken in the EIS for areas where built operational infrastructure would be visible (refer to section 13.5.3 of the EIS). The Rozelle interchange would have a highly functional and ordered landscape character, comprising architecturally well-considered design elements and new open space.

General impacts associated with the ventilation outlets at the Rozelle interchange and measures to manage these visual impacts are discussed in **section C13.4.1**. Impacts to specific views around the Rozelle interchange identified by submitters are discussed below.

Impact to views around The Crescent

The realignment and upgrade of The Crescent/Victoria Road intersection would require the removal of Buruwan Park and the adjacent vegetation between Whites Creek and City West Link. This would have the effect of removing the existing screening between the Rozelle Bay light rail stop and the project, opening up views to City West Link, the land bridge crossing of City West Link, pedestrian bridge crossing of The Crescent and the ventilation outlets at the Rozelle Rail Yards. However, it would also open up views to Rozelle Bay, Balmain industrial area and White Bay Power Station, and the city skyline, which were not previously available.

A key element of this change in view is that the extent of the project would make it highly unlikely that tree cover could be reinstated to this area, and consequently, this change would be permanent. As identified in Appendix O (Technical working paper: Landscape and visual impact) of the EIS and **Chapter E1** (Environmental management measures), measures will be investigated to retain the mature trees of high retention value adjacent to the light rail corridor at the corner of The Crescent and City West Link, and to provide screening vegetation alongside the retaining wall edge of the light rail corridor, to minimise landscape and visual impacts.

Impact to views from Easton Park

The visual impact assessment identified the potential for high visual impacts for the view looking south from Easton Park to the project for recreational users of the park.

The ventilation facility (primarily the ventilation outlets as part of the facility at the Rozelle Rail Yards) from this view would be of a high to moderate level of contrast with that of the existing view, notwithstanding that much of this would comprise new open space. The new open space would be an improvement to this component of the view, which currently consists of a light industrial area. Vegetation within the new open space created by the Rozelle interchange would eventually screen some of this view.

While the architecture and design of the ventilation facility would be well considered for the surrounding area, the structure may nonetheless be perceived as a low quality visual element given its purpose, bulk and scale in an open area and subsequent visual prominence. The final architecture and design of the facility would be subject to the UDLP for the Rozelle Rail Yards. Development of the UDLP would include consideration of the key ventilation facility design principles identified in Annexure 2 of Appendix L (Technical working paper: Urban design) of the EIS. Measures would be investigated during detailed design to reduce the height, bulk and scale of ventilation outlets at Rozelle and provide materials/finishes that reduce impacts to sensitive visual receiver locations.

For receiver locations around the Rozelle interchange, the ventilation outlets as part of the ventilation facility would be viewed within the context of other proximate, large infrastructure elements in the skyline, such as the White Bay Power Station chimney stacks, the Glebe Island grain silos, and Anzac Bridge.

Impacts to views around Rozelle Bay

Impacts to views around Rozelle Bay were considered for the view looking north from Glebe Foreshore parklands to the project. Impacts to this view for passive recreational users were assessed as being Moderate-low and impacts to the view for active recreational users were assessed as being low.

The ventilation outlets in particular would be visually prominent from this location, particularly given the limited height of tree planting between the proposed ventilation outlets and nearby receivers. These elements would comprise visually contrasting elements in the skyline within the immediate vicinity of the project. However, within the larger setting as viewed from this receiver location, these new elements would be broadly congruent with other proximate, large infrastructure elements in the skyline, such as the White Bay Power Station chimney stacks, the Glebe Island grain silos, and Anzac Bridge. The project would, however, seek to integrate the potentially visually prominent elements together with the improved setting afforded by the new open space. The final architecture and design of the facility would be subject to the UDLP for the Rozelle Rail Yards.

Development of the UDLP would include consideration of the key ventilation facility design principles identified in Annexure 2 of Appendix L (Technical working paper: Urban design) of the EIS. Measures would be investigated during detailed design to reduce the height, bulk and scale of ventilation outlets at Rozelle and provide materials/finishes that reduce impacts to sensitive visual receiver locations.

Impacts to the visual amenity of The Bays Precinct

The project was developed with consideration of *The Bays Precinct, Transformation Plan* (UrbanGrowth NSW 2015b) which establishes the strategy for how The Bays Precinct would be developed over 20 years for residential, employment, entertainment and open space uses. The cumulative impacts of the M4-M5 Link and The Bays Precinct project could result in a considerable shift in land use, built form and landscape character in The Bays Precinct.

With the intended future growth in the area (particularly with regard to The Bays Precinct), the M4-M5 Link aims to deliver much needed quality open space and passive recreational space. This open space could be further developed in the future (by others) to optimise compatibility between the projects.

There is opportunity for integration between the M4-M5 Link project and The Bays Precinct project to optimise a balanced outcome from a visual amenity perspective. Roads and Maritime has been working with UrbanGrowth NSW to ensure their early plans for The Bays Precinct have been considered in relation to the design of the Rozelle interchange. The project would provide a path that connects to the existing Anzac Bridge shared path by travelling underneath the Victoria Road/City West Link intersection. This active transport connection would provide future possibilities for connections into The Bays Precinct and contribute to visual connectivity.

Operational infrastructure at the Rozelle Rail Yards

The need for two separate motorway operations complexes within the Rozelle Rail Yards is primarily due to the requirement to locate the ventilation supply and outlet facilities as close to the associated ventilation supply and exhaust tunnels as possible. It should be noted that the concept design incorporates the roof space of some of operational buildings as part of the overall open space landscape. By doing so, operational infrastructure would be integrated into the landscape design at this location.

Opportunities to co-locate the motorway operations complexes within the Rozelle Rail Yards would be investigated during detailed design. As identified in Appendix O (Technical working paper: Landscape and visual impact) of the EIS and **Chapter E1** (Environmental management measures), the new open space at Rozelle would be integrated with the Lilyfield Road streetscape through considered street tree planting see LV13 and associated landscape works to ensure areas of land are not visually isolated.

The final design of the constructed wetland at the Rozelle interchange would be developed through the preparation of the UDLP for the Rozelle Rail Yards. An example of constructed wetlands from other projects is provided in section 5.5.6 of Appendix L (Technical working paper: Urban design) of the EIS. Wetlands and other water sensitive urban design features would be designed to be functional and visually appealing areas (the wetland at Sydney Park is an example of this).

Measures to manage visual impacts

Visual impacts of the project would be minimised through considered development and implementation of the urban design and landscaping features in accordance with UDLPs that would be developed for the project. The UDLPs would be prepared in consultation with relevant councils, stakeholders and the community. Urban design and landscape works would include the provision of landscape planting along and around key visible infrastructure such as ventilation facilities and motorway operations complexes. Over time and as this vegetation matures, the benefits provided by landscape planting will improve.

Mitigation and design measures proposed for the project to minimise identified visual impacts are outlined in **Chapter E1** (Environmental management measures) and include investigating measures during detailed design to reduce the height, bulk and scale of ventilation outlets at the Rozelle Rail Yards subject to achieving desired ventilation outcomes, and in accordance with the design principles detailed in the M4-M5 Link Urban design report.

C13.4.4 Visual impacts around the Iron Cove Link

Submitters raised concern about visual impacts from the project around the Iron Cove Link. Concerns included:

- The bulk and scale of the Iron Cove Link motorway operations complex (MOC4) including the ventilation outlet is not consistent with the local streetscape of Rozelle and Balmain
- Visual impacts from the ventilation facilities near Springside Street, Callan Street, Victoria Road and Terry Street, Rozelle
- The condition of approval to include a requirement for measures to minimise the visual impact of ventilation facilities, especially on Victoria Road near Terry Street
- The ventilation facility near Iron Cove should be located below ground level or on the foreshore below Iron Cove Bridge to reduce visual impact on Victoria Road.

Response

The EIS describes the Iron Cove Link ventilation facility as being located between Springside and Callan streets at Rozelle and comprising a ventilation outlet, ventilation building (including the jet fans) and an electrical substation. The ventilation outlet would be located within the centre of Victoria Road near Terry Street while the ventilation building and substation would be located on the southern side of Victoria Road.

An assessment of the visual impact of operational infrastructure at the Iron Cove Link was provided in section 13.5.4 of the EIS. General impacts associated with the ventilation outlets at the Iron Cove Link and measures to manage these visual impacts are discussed in **section C13.4.1**. Impacts to specific views around the Iron Cove Link identified by submitters are discussed below.

Options for the relocation of operational infrastructure for the Iron Cove Link are discussed in **section C4.11**.

Impacts to residential receivers at Springside Street, Rozelle

The visual impact assessment identified the potential for Moderate visual impacts for residents and pedestrians for the view looking north along Springside Street towards Victoria Road. In this location, the ventilation outlet building would be moderately visually prominent from much of the eastern side of Springside Street, including being seen against the skyline, an effect that would increase when moving north up the hill from this location. The scale, form and visual mass of the building would be moderately incongruent with the existing streetscape, particularly at the northern end of the street when viewed from a closer proximity.

However, there are no visually significant elements being obstructed from this receptor location. The duration of viewing of the outlet from this location is likely to be low, with most people generally exposed to the view when entering and leaving their residences, with the exception being views from back garden areas within proximity of the project, where the ventilation building would have the potential to be visually prominent. Visual impacts are anticipated to be similar for the nearby Callan Street.

Impacts to residential receivers at Terry Street, Rozelle

The visual impact assessment identified the potential for High visual impacts for residents on the west side of Terry Street for the view looking south along Terry Street towards the project. The sensitivity of the residents of the three storey apartments on the west side of Terry Street was considered to be high as the apartments look out onto a well-considered, almost entirely residential streetscape of high visual quality.

The magnitude of the change for residents on the west side of Terry Street was also considered to be high given that the view of the ventilation outlet (as part of the Iron Cove Link motorway operations complex (MOC4)) would comprise a substantial, highly contrasting element within the context of a well-articulated and substantially detailed residential development within this part of the street, and the revealed, small scale, period housing profiles on the opposite side of Victoria Road.

However, the removal of residential and commercial development fronting onto Victoria Road, and replacement with well setback, lower scale existing period housing profiles and streetscape improvements, in addition to centre median planting with substantial tree cover, would improve the visual character of this central part of the view. High visual impacts are not anticipated for the other viewpoints identified around the Iron Cove Link.

Measures to manage visual impacts

The detailed design and construction of the M4-M5 Link project would be managed to ensure that, as far as possible, the identified landscape and visual impacts are minimised by implementation of a range of general and specific measures.

Visual impacts of the project would be minimised through considered development and implementation of the urban design and landscaping features in accordance with UDLPs that would be developed for the project. The UDLPs would be prepared in consultation with relevant councils, stakeholders and the community. Urban design and landscape works would include the provision of landscape planting along and around key visible infrastructure such as ventilation facilities and motorway operations complexes. Over time and as this vegetation matures, the benefits provided by landscape planting will improve.

Mitigation and design measures that are proposed for the project to minimise identified visual impacts are outlined in **Chapter E1** (Environmental management measures) and include investigating measures during detailed design to reduce the height, bulk and scale of ventilation outlets at Iron Cove subject to achieving desired ventilation outcomes, and in accordance with the design principles detailed in the M4-M5 Link Urban design report.

C13.4.5 Visual Impacts from directional and variable signage

A submitter raised concern about the visual impacts from the new directional and variable signage. In particular the submitter was concerned with the directional and variable messaging signs being unsuitable for residential locations and they suggested that measures should be implemented to ensure visual impact from these signs is minimised.

Response

Wayfinding signage for the road infrastructure will be developed to the satisfaction of Roads and Maritime. Consultation will occur with the relevant local council regarding road signs for council roads. Signage for road infrastructure will be installed prior to the commencement of operation.

Traffic, locational, directional, warning and variable message signs would be incorporated within the tunnels and on surface roads at approaches to the tunnels. Variable message signs would be located within or directly adjacent to areas of operational infrastructure for the project and the existing adjacent arterial road network. Directional signage would be installed in accordance with the Austroads and Roads and Maritime standards, with a focus on providing clear and unambiguous direction to motorists.

All signage within the tunnels will be backlit and located to provide clear, highly visible, progressive and instructive decision-making information for motorists while minimising light spill and other visual impacts to visual receivers including nearby residential receivers. Variable message signs within busy road corridors are inherently consistent with the landscape character of such areas.

C13.5 Urban design and landscaping at Wattle Street at Haberfield

Two submitters raised concerns about the urban design and landscaping at Wattle Street at Haberfield. Refer to section 13.5 of the EIS for details of potential operational urban design and visual amenity impacts of the project.

C13.5.1 Urban design and landscaping at the Wattle Street interchange

A submitter was concerned that the EIS did not contain measures regarding the urban design at Haberfield. A submitter suggested that 'greening' the facade of the ventilation facility at Haberfield will make its appearance more sympathetic to the local area.

Response

The design of the Wattle Street interchange has been developed and assessed as part of the M4 East EIS. The urban design and landscaping approach for the Wattle Street interchange is detailed in the Draft M4 East UDLP which was publicly exhibited in late 2016. An addendum to the UDLP containing plans for the M4 East eastern and western ventilation facilities was on public exhibition in early 2017. Community submissions were reviewed following exhibition and would be addressed in the next revision of the plan. This UDLP includes the M4-M5 Link entry and exit ramps and tunnel portals (which are being built as part of the M4-M5 Link).

Once construction of the M4 East and M4-M5 Link projects is completed, remaining project land not required for operational infrastructure or subject to landscape works as part of the M4 East project would be rehabilitated and would be subject to the M4 East project's RLMP, UDLPs and/or the M4 East Legacy Project. These plans are currently being prepared by the M4 East project team and will be subject to the consultation requirements and timeframes set out in the M4 East project conditions of approval. The M4-M5 Link would not alter the final urban design and landscape outcomes for the M4 East, but may impact the timing of implementation of certain aspects.

C13.6 Urban design and landscaping at Rozelle interchange

12 submitters raised concerns about the urban design and landscaping at the Rozelle interchange. Refer to section 13.5 of the EIS for details of potential operational urban design and visual amenity impacts of the project.

C13.6.1 Urban design around Rozelle interchange and surrounding surface work

Submitters raised queries and concerns around the details of urban design and landscaping around the permanent operational infrastructure proposed at Rozelle interchange. Specific concerns include:

- The Rozelle Rail Yards park does not address key urban design objectives as the vision and primary function of the park is dominated by and structured around above ground operational infrastructure
- The ventilation facilities at the Rozelle Rail Yards should be consistent with the surrounding landscape
- The urban design for the Rozelle Rail Yards should be consistent with the heritage of the area
- There should be an increase in vegetation and landscaping around proposed works at Rozelle
- The ventilation supply, water treatment facilities and wetland at the Rozelle Rail Yards will remove the available area for potential open space and should be relocated or moved underground to provide more open space
- The noise wall in the Rozelle interchange parklands will visually separate the open space from residents
- Noise walls for the project should be 'green' walls
- The open space at the Rozelle Rail Yards will be divided by the new drainage channel

- Day to day maintenance of the Rozelle open space should be done by the Inner West Council.
- Landscaping should connect and be consistent with existing open space networks in Sydney such as the Green Grid and GreenWay
- Water sensitive urban design should be implemented at the Rozelle Rail Yards
- Concern that urban design and landscaping works will be delayed by the proposed future Western Harbour Tunnel project.

Response

The project would deliver up to 10 hectares of new open space and active transport links for the community at the Rozelle Rail Yards as committed to by the NSW Government (announced in July 2016). A review of the Rozelle interchange against urban design principles for the project is presented in Table 13-23 of the EIS.

The works that would be carried out at the Rozelle interchange would include (but not be limited to):

- Detailed review and finalisation of the architectural treatment of the motorway operational infrastructure
- Reshaping of the landform at the site around the motorway operational infrastructure
- Provision of pedestrian and cyclist paths and bridges
- Provision of new open space within the Rozelle Rail Yards, including landscape works
- Revegetation and planting, including tree planting, at key locations including:
  - Around motorway operational infrastructure such as the ventilation facility
  - Around the constructed wetland, bioretention swale and the drainage channels
  - Adjacent to pedestrian and cyclist paths
  - Around the perimeter of the Rozelle Rail Yards.

A concept design for these works has been prepared, included in Appendix L (Technical working paper: Urban design) of the EIS. The concept design would be refined during the development of UDLPs, which will be prepared based on the detailed design and in accordance with relevant commitments in the EIS. The UDLPs would be prepared in consultation with relevant councils, stakeholders and the community.

Above ground motorway structures

The three ventilation outlets at the Rozelle ventilation facility would be up to 35 metres in height (above existing ground level) and would be located near the intersection of City West Link and The Crescent. Their design, including material and colour choice, would respond to the local character, which includes the White Bay Power Station chimneys and Anzac Bridge pylons.

The air intake facility, water treatment facility and electricity substation within the Rozelle interchange would be designed in a manner that allows them to become recessive elements within the overall park design. This would be achieved by incorporating the roof of operational buildings within the overall landscape, while still allowing for appropriate access. Elements such as the water treatment facility and ventilation facilities would be co-located within the landscape to offer more functional space to the community. A discussion regarding options to relocate operational infrastructure at the Rozelle Rail Yards is provided in **section C4.9**.

Options to relocate the ventilation facility are discussed in **section C4.16.1**. Justification for the height of ventilation facilities is provided in **section C5.5.1**. For the ventilation outlets proposed for the M4-M5 Link, including the outlets at Rozelle and Iron Cove, the height, diameter and number of the outlets was primarily determined by the volume of air to be expelled (which is calculated based on tunnel width and length) and project air quality objectives. The height of the outlets was optimised by testing the effect of different outlet heights on the ground level concentrations of pollutants. See **section C5.5.1** for further information regarding ventilation outlet heights.

Measures will be investigated during detailed design to reduce the height, bulk and scale of ventilation outlets at Rozelle, Iron Cove and St Peters, and provide materials/finishes that reduce impacts to sensitive visual receiver locations.

Noise walls are not proposed in the concept design for the Rozelle interchange. Noise walls may be required along/within the vicinity of the southern side of the widened Victoria Road at the Iron Cove Link. The noise walls are one of a number of noise mitigation options being investigated for the project and were therefore not included in the concept design for the project. If noise walls are deemed necessary, their location, form and function and potential visual impacts will be considered and assessed during detailed design. The design and treatment of permanent built works will be described in the relevant UDLPs for the project (see environmental management measure UD1 in **Chapter E1** (Environmental management measures)). Consultation will be undertaken with local residents in the event that noise walls are required for the project.

An Interpretation Strategy will be developed and implemented to identify and interpret the key heritage values and stories of the heritage areas affected by the project and inform the development of the UDLPs for the project (including at Rozelle interchange), in accordance with the *Interpreting Heritage Places and Items Guideline* (NSW Heritage Office 2005). The Interpretation Strategy will:

- Build on themes, stories and initiatives proposed as part of other stages of WestConnex to ensure a consistent approach to heritage interpretation for the project
- Include themes and stories including the Rozelle railways historic functions, trains and trams transport, industrialisation and the Rozelle-Darling Harbour Goods Line
- Identify how the rail related infrastructure salvaged from the Rozelle Rail Yards will be reused.

Recreational open space

New, passive open space would be provided within the Rozelle Rail Yards, which were previously disused and inaccessible to the public. While some areas at the Rozelle Rail Yards would be required for above ground motorway structures, the project would deliver an increase to open space in this area.

No active recreational facilities form part of the scope for the project. The open space could be further developed in the future (by others) for specific active recreational purposes. Significant tree planting along the perimeter of the site would continue the canopy of surrounding areas. Large grassed areas would be complemented by tree planting and garden beds to create a series of spaces that could accommodate a range of future uses according to community needs.

Active transport links provided within and around open space and operational motorway infrastructure would ensure adequate north-south and east-west connectivity over the proposed drainage channel at the Rozelle Rail Yards so as to not isolate areas of open space.

The northern drainage channel is aligned to most efficiently convey drainage flows between the upstream (near Lilyfield Road) and downstream connection points (to Rozelle Bay), which are fixed.

Responsibility for the maintenance of the open space at the Rozelle Rail Yards would be subject to an agreement between Roads and Maritime and relevant stakeholders, including Inner West Council.

The open space the Rozelle Rail Yards would be consistent with the Sydney Green Grid by expanding Sydney's strategic open space network. The project would not directly connect with the Cooks River to Iron Cove Greenway, however Inner West Council (which is responsible for the GreenWay along with Canterbury Bankstown Council) would be consulted with during the development of the UDLP for the Rozelle Rail Yards. Future expansions of the GreenWay would be subject to the decisions of Inner West Council and the City of Canterbury Bankstown.

Water sensitive urban design (WSUD) would be considered in the detailed design of the project during the development of UDLPs. Refer to section 5.5.6 of Appendix L (Technical working paper: Urban design) of the EIS for further detail regarding the considerations that would be included in the detailed design of the project in relation to WSUD.

Proposed future Wester Harbour Tunnel project

A section of the Rozelle Rail Yards around the proposed future Western Harbour Tunnel entry and exit ramps would be kept as an area of hardstand in anticipation of it being used to support construction of the proposed future Western Harbour Tunnel project. As part of the project, this area would be physically separated from the remainder of the interchange to restrict access. The possible future use of this area would mean that landscaping and revegetation works may need to be staged.

C13.7 Urban design around the Iron Cove Link and surrounds

Four submitters raised concerns about the urban design and landscaping for Iron Cove Link. Refer to section 13.5 of the EIS for details of potential operational urban design and visual amenity impacts of the project.

C13.7.1 Urban design and landscaping around Iron Cove Link

Submitters raised queries and concerns around the details of urban design and landscaping around the permanent operational infrastructure proposed at Iron Cove Link. Specific concerns include:

- Suggest that street trees removed from Victoria Road near the Iron Cove Link be replanted
- Requests a reduction in the ventilation outlet height on Victoria Road and enhancement with urban design, or moved to an alternative location if possible
- Requests that the land between Springside Street and Byrnes Street be developed for active recreation for the community and include plenty of trees
- There should be 'no visually offensive concrete walls' close to Iron Cove Bridge at Rozelle.

Response

As part of the project, urban design and landscape works would be carried out adjacent to disturbed areas associated with the Iron Cove Link surface works. The urban design and landscape works that would be conducted as part of the Iron Cove Link surface works would include (but not be limited to):

- Detailed review and finalisation of the architectural treatment of the motorway operational infrastructure
- Reshaping of the landform around the motorway operational infrastructure
- Reinstatement of an improved pedestrian and cyclist path along the southern side of Victoria Road, that would connect to the Bay Run, Iron Cove Bridge and local streets
- Provision of new open space, including landscape works
- Revegetation, including tree planting, at key locations including:
  - Around permanent operational infrastructure such as the ventilation facility
  - Adjacent to pedestrian and cyclist paths
  - Along the southern boundary of the land subject to the UDLP near Byrnes Street, Clubb Street and Toelle Street.

A concept design for these urban design and landscape works has been prepared having regard to the urban design objectives and principles. The concept design is included in Appendix L (Technical working paper: Urban design) of the EIS and includes identification of potential future uses of land around the Iron Cove Link surface works that could be delivered as part of the urban design and landscape works, including the provision of social and community facilities.

The design would be refined during the development of UDLPs for the project, which would be prepared based on a detailed design and in accordance with relevant commitments in the EIS, and in consultation with relevant councils, stakeholders and the community.

Opportunities to retain high retention value trees will be explored where practical during detailed design. Environmental management measure B6 (see **Chapter E1** (Environmental management measures)) for the project identifies that as many trees as possible will be retained during construction. In the event that tree removal cannot be avoided, a tree replacement strategy will be prepared. Replacement trees will be included in the UDLPs to be developed and implemented for the project. Replacement trees will be planted within, or close to, the project footprint or other locations, in consultation with the relevant councils.

The project would also assist in future urban renewal along sections of Victoria Road. The forecast reduction in traffic along sections of Victoria Road, resulting from the Iron Cove Link, presents a number of opportunities, including a revitalised 'street' for businesses, locals and visitors. The future renewal of Victoria Road, however, is out of the current scope of this project.

Options to relocate the ventilation facility are discussed in **section C4.16.1**. Justification for the height of ventilation facilities is provided in **section C5.5.1**. For the ventilation outlets proposed for the M4-M5 Link, including the outlets at Rozelle and Iron Cove, the height, diameter and number of the outlets was primarily determined by the volume of air to be expelled (which is calculated based on tunnel width and length) and project air quality objectives. The height of the outlets was optimised by testing the effect of different outlet heights on the ground level concentrations of pollutants. See **section C5.5.1** for further information regarding ventilation outlet heights.

Measures will be investigated during detailed design to reduce the height, bulk and scale of ventilation outlets at Rozelle, Iron Cove and St Peters, and provide materials/finishes that reduce impacts to sensitive visual receiver locations.

C13.8 Urban design and landscaping impacts - general

35 submitters raised concerns about the urban design and landscaping impacts of the project. Refer to section 13.5 of the EIS for the landscape and visual impact assessment.

C13.8.1 General urban design considerations

Submitters raised concerns that the urban design considerations do not integrate with the surrounding areas. Specific concerns include:

- Suggest that more trees be planted than what is proposed in the EIS and that these include trees with dense canopies to provide visual screening
- SMC should capitalise on opportunities to obtain mature plantings of trees at risk from other infrastructure works in the Greater Sydney area
- Suggest an increase in vegetation and landscaping around proposed works at Rozelle and Lilyfield
- If trees are to be removed from the site, they must be replaced with mature trees as soon as the remediation of the site commences
- Rehabilitation should be undertaken where trees and vegetation is removed
- The project should be updated to include adequate vegetation and open space areas near roads and ventilation shafts
- Submitter is disappointed that the administrative buildings and ventilation facilities are designed without architectural innovation
- The tunnels and streetscape would look very different to what is presented in the artistic impressions
- Suggest that art be included throughout the project and that an artist be employed for the WestConnex program of works
- All landscaping, paths and other community infrastructure should be delivered to Inner West Council fully constructed and all buildings (if any) renovated before handover
- The visual amenity of tunnel portals should be improved by design treatments.

Response

The urban design principles and objectives described in section 13.2 of the EIS form the basis for the development of detailed plans that would identify the form and typology of landscaping that would be carried out as part of the project. These include creating a sustainable and enduring design and integrating the motorway into the landscape. The project has committed to delivering new open space at the Rozelle Rail Yards, which are currently disused and inaccessible to the public.

The project would provide street tree planting for screening and shade, and mixed sizing of planting where stratification of the canopy is desired. Planting of mature and semi-mature trees will be considered for the project. Not all species of trees are conducive to transplanting, and this will be considered when developing plans to provide street trees as part of landscaping works. The project will aim to use tree species that will eventually provide appropriate levels of screening. It is unlikely that trees removed from other infrastructure projects would be used for planting as it is unlikely that the removal of trees for other infrastructure projects will align with the timing of tree planting for the M4-M5 Link.

As identified in Appendix S (Technical working paper: Biodiversity) of the EIS, opportunities to retain high retention value trees will be explored, where practicable, during detailed design and tree sensitive construction techniques will be considered. Environmental management measure B6 (see **Chapter E1** (Environmental management measures)) for the project identifies that as many trees as possible will be retained during construction. In the event that tree removal cannot be avoided, a tree replacement strategy will be prepared. Replacement trees will be included in the UDLPs to be developed and implemented for the project. Replacement trees will be planted within, or close to, the project footprint or other locations, in consultation with the relevant councils and in accordance with Austroads guidelines.

Revegetation and planting, including tree planting, would be undertaken at key locations as part of urban design and landscape works including around key motorway operational infrastructure such as ventilation facilities.

The artist's impressions included in the EIS have been included to visually represent the bulk and scale of motorway operational infrastructure and do not incorporate architectural design treatments. A detailed review and finalisation of architectural treatment of the project operational infrastructure, including ventilation facilities, would be undertaken during detailed design. The architectural treatment of these facilities would be guided by ventilation facility performance requirements, the outcomes of community consultation and the urban design principles identified in section 13.2.2 of the EIS.

Section 5.5.7 of Appendix L (Technical working paper: Urban design) of the EIS identifies the mechanism for the inclusion of public art in the project through the development of UDLPs. The Urban Design Review Panel established by Roads and Maritime would provide advice regarding the development of UDLPs and would make recommendations in relation to artistic aspects of the project.

Responsibility for the maintenance of the open space delivered by the project would be subject to an agreement between Roads and Maritime and relevant stakeholders, including Inner West Council. Construction of relevant components of the project would be completed prior to the finalisation of such an agreement.

Annexure 1 of Appendix L (Technical working paper: Urban design) of the EIS includes a portal design review. The design review considers national and international approaches to portal design and identifies strategies to be considered during the detail design of the operational infrastructure.

Strategies identified for portal design include:

- The design should consider different user experience, balancing the experience of motorists who would often only view the portal for a matter of seconds, with the slower, pedestrian scale of the experience for surrounding communities
- The architectural approach should mark the portals in the landscape with a design that is considerate of the local context.

The final urban design (including architectural treatments) and landscape works that would be carried out by the project will be documented in UDLPs. UDLPs will be prepared in consultation with stakeholders and the community prior to the commencement of permanent built surface works and/or landscape works and will present an integrated urban design for the project (see environmental management measure UD1 in **Chapter E1** (Environmental management measures)). The concepts and principles outlined in the UDLPs will be developed into a detailed design for operational project infrastructure.

C13.9 Safety and crime prevention through design

169 submitters raised concerns about safety and crime prevention through design. Refer to section 13.5 the EIS for details of crime prevention through environmental design of the project.

C13.9.1 Safety and crime prevention through design

Submitters raised concerns on how the project design would reduce potential crime or antisocial behaviour and increase safety. Submitters' specific concerns include:

- Street trees should be introduced or retained as they are important safety mechanisms
- The Darley Road motorway operations complex (MOC1) will prevent safe and direct pedestrian access to the light rail stop, with users required to walk down a dark and winding path
- Pedestrian and bike routes through the open space should be equipped with appropriate lighting to improve safety during late hours
- The ventilation and other facilities at the Rozelle interchange could have safety issues due to distance between the operational infrastructure and the large open space to the east and low passive surveillance from nearby residential buildings and passers-by
- Parklands are visually isolated from residents north of Lilyfield and the proposed noise wall will increase safety issues
- The pedestrian bridge needs to include high quality lighting to offset the security risk of an underpass
- A crime prevention audit of the current design concepts should be undertaken
- Concerned about the safety of children at the Rozelle Rail Yards wetlands
- Objection to the proposed east-west pedestrian/cyclist underpass to replace the existing bridge over Victoria Road at Lilyfield as people feel safer on a bridge in public view and people walking to the buses will not feel safe using the underpass at night.

Response

Principles of crime prevention through environmental design (CPTED) would be considered and incorporated into the UDLPs for the project. As part of that process, the guidance provided by the Safer By Design program managed by the NSW Police Force Crime Prevention and the Assessment of Development Applications (Department of Urban Affairs and Planning 2001) would be taken into account. In addition, the design guidelines *Designing to Minimise Vandalism* (Final Draft) (NSW Roads and Traffic Authority 2008a) and *WestConnex Urban Design Corridor Framework* would also be taken into account to minimise anti-social behaviour and improve safe public use of amenities.

Key CPTED principles that would be considered for incorporation into the project include:

- Vulnerability:
  - The public domain would be designed and managed to reduce or limit risk from assault by providing well-lit, visible places and pedestrian and cyclist systems and routes to important places
  - The design and management of places would avoid creating or maintaining hidden spaces close to pedestrian/cyclist travel routes in the public domain, in ways that remain consistent with the purpose of the place
  - The design and management of the public domain would provide a variety of available routes
  - The pursuit of safety would be delivered in ways consistent with the purpose of the place
- Legibility: the public domain would be designed, detailed and managed to make them easy to navigate and understand for users, especially pedestrians and cyclists, without losing the capacity for variety and interest
- Territoriality: security would be supported by designing and managing spaces and buildings to define clearly legitimate boundaries between private, semi-private, community group and public space

- Ownership of the outcomes: a feeling of individual and community ownership of the public domain and associated built environments would be promoted to encourage a level of shared responsibility for their security
- Management: the public domain would be designed and detailed to minimise damage and the need for undue maintenance, without undermining the aesthetic and functional qualities that make the places attractive to the community. Systems of both regular and reactive maintenance and repair would be implemented to maintain the quality of the places. A regular auditing system of CPTED issues in the public domain would be implemented
- Surveillance: the public domain and buildings would be designed and managed to maximise the potential for passive surveillance.

During detailed design, specific design measures would be developed for surface operational infrastructure to limit the potential for antisocial behaviour and maximise safety for the public and site workers.

The detailed design for the project would also include a detailed lighting concept that would applied to all pedestrian paths and bridges which would be developed in accordance with AS/NZS 1158 Lighting for roads and public spaces, AS 4282 Control of the obtrusive effects of outdoor lighting, AS 4282 Control of the obtrusive effects of outdoor lighting, and AS/NZS 60598 – Series Luminaries. The principles that would inform the detailed design are detailed in section 5.5.5 of Appendix L (Technical working paper: Urban design) of the EIS and include a principle to promote safety.

The constructed wetland would be designed to appropriately mitigate safety risks for children.

The underpass at Victoria Road would be designed in accordance with the relevant principles of CPTED. The extent of the underpass under the Victoria Road bridge structure would be limited to a distance of around 50 metres. The underpass would be a relatively open space with a generous clearance height to the underside of the bridge structure and a generous width between the bridge pylons. It would also be relatively straight with a clear line of sight provided between the entry and exit points. Adequate lighting and surveillance would be provided in and around the underpass for safety and security.

The underpass would follow the grade of the finished ground level at this location and would connect to the active transport links which run:

- To the west through the new open space area at the Rozelle Rail Yards
- To the east to connect with Anzac Bridge, the opposite (east) side of Victoria Road and with potential for a future connection into The Bays Precinct area.

The underpass is considered to be a more effective and user friendly option for crossing Victoria Road by comparison to the existing elevated overpass.

C13.10 Active transport connectivity

202 submitters raised concerns about active transport connectivity for the project. Refer to section 13.5.3 and section 13.5.4 of the EIS and Appendix N (Technical working paper: Active transport network) for details of active transport for the project.

C13.10.1 Active transport connectivity

Submitters raised concerns that the urban design consideration does not provide active transport connectivity while other submitters supported the active transport opportunities that would be provided by the project. Specific issues include:

- The project does not adequately cater to the needs of cyclists
- The project should maximise connectivity
- The project should provide greater pedestrian and cyclist access across Victoria Road, City West Link and into the open space at the Rozelle Rail Yards
- The project should include better separated and more efficient active transport links at Rozelle and Annandale given the upgrades to The Crescent and City West Link for residents of Rozelle and Annandale

- The construction of this motorway will affect the pedestrian links between adjoining suburbs
- The alternative route proposed during construction along Bayview Street to Johnston Street is very steep
- Concern over the removal of the pedestrian and cycle bridge (also referred to as the 'Beatrice Bush Bridge') over Victoria Road/City West Link and associated removal of pedestrian access to Anzac Bridge and Glebe
- The removal of Buruwan Park will impact on cyclists, as there is a major cycle route through the park. Buruwan Park also lies on a major cycle route from Railway Parade through to Anzac Bridge and the Sydney central business district (CBD). The alternative route being suggested is poor and inadequate
- Objects to proposed overpass on Victoria Road
- The project will impact pedestrian connectivity and access to bus stops on Victoria Road, between Balmain and Rozelle, by the removal of the two footbridges from Victoria Road to The Crescent
- Additional footbridges or underpasses across Victoria Road to Darling Street are required
- Removing the traffic lights currently linking Victoria Road to the Western Distributor would impact on pedestrians accessing buses into the city and cyclists heading into the city, as well as to Glebe and beyond
- The EIS provides no assurances that current pedestrian crossings across Victoria Road between Toelle Street/Terry Street and Moodie Street/Wellington Street would be preserved
- The removal of the pedestrian bridge over Victoria Road would negatively affect cyclists, pedestrians and disabled people, who currently use it to access the bus stops (including the bus stop opposite Hornsey Street) and the city and Glebe
- The underpass beneath Victoria Road would require a considerable diversion and would involve climbing down and up either stairs or a long bike ramp compared to the existing overpass
- Request for details of the pedestrian access impacts to King George Park and The Bay Run
- The project will remove the pedestrian crossing in front of the Darley Road site
- The project will limit access to light rail at Darley Road for pedestrians including people with disabilities
- How does the project propose to maintain and enhance the links between the communities on either side of the interchanges for the project
- The project has not provided adequate active transport infrastructure around the Haberfield/Ashfield/Five Dock area
- Suggests a direct pedestrian link between Gordon Street and the Rozelle Bay light rail stop.

Response

An active transport strategy has been developed for the project and is provided in full in Appendix N (Technical working paper: Active transport strategy) of the EIS. The active transport strategy was developed in consultation with stakeholders and through analysis of current and proposed active transport routes and relevant active transport policies and guidelines. The project provides an opportunity to address poor active transport connectivity in the study area, including along Victoria Road and the Rozelle Rail Yards at Rozelle. In addition, the diverting of through traffic from local roads onto roads upgraded as part of the project around the interchanges and into the WestConnex tunnels would improve pedestrian and cyclist safety.

Key north–south connectivity would be established via the two new pedestrian and cyclist bridges over City West Link. These links would greatly improve accessibility between Glebe/Annandale and Rozelle/Lilyfield. They would also provide connectivity between Rozelle Bay and Iron Cove, through key green spaces of Bicentennial Park, open space at the Rozelle Rail Yards, Easton Park and Callan Park.

East–west connectivity would be provided through the site connecting to the Lilyfield Road cycleway adjacent to the CBD and South East Light Rail (CSELR) Rozelle maintenance depot at the western end of the Rozelle Rail Yards. A path would be provided that connects to the existing Anzac Bridge shared path by travelling underneath the Victoria Road/The Crescent intersection. This connection would provide future possibilities for connections into The Bays Precinct.

The project would improve connectivity and safety for pedestrians and cyclists, and would contribute to the active transport network in the region. Cyclist and pedestrian paths delivered by the project would create safe links that have reasonable grades and are separated from vehicular traffic. The final gradients of cyclist and pedestrian paths would be subject to detailed design.

Indicative active transport being delivered as part of the project is listed in **Table C13-5**. The active transport links would maintain and enhance the links between communities on either side of the interchanges for the project. Active transport being delivered as part of the project would be complemented by other active transport projects being delivered separately by others as summarised in Table 7-1 of Appendix N (Technical working paper: Active transport strategy) of the EIS.

Table C13-5 Indicative active transport links being delivered as part of the project

Route	Benefits	Type	Approximate length
Rozelle Rail Yards Link Links the Bay Run, The Bays Precinct and the GreenWay in the west to Anzac Bridge and the Sydney CBD in the east	Links Anzac Bridge through The Bays Precinct to Lilyfield Road at the western end of the Rozelle Rail Yards[1]	Separated cycle path	250 metres
	Provides the junction connecting Rozelle Rail Yards and Victoria Road to The Bays Precinct	Underpass	150 metres
	Provides the link between Victoria Road and the CSELR Rozelle maintenance depot	Separated cycle path	1,000 metres
Victoria Road – Iron Cove Link Links the northern suburbs of Drummoyne and Russel Lea and Chiswick to The Bays Precinct and the Sydney CBD	Connecting the eastern side of the Rozelle Rail Yards along Victoria Road to the intersection of Robert Street	Separated cycle path	250 metres
	Linking the intersection of Springside Street to Iron Cove Bridge and the Bay Run	Separated cycle path	450 metres
	Connecting Victoria Road to The Crescent over the Rozelle Rail Yards	Bridge	200 metres
	Connecting Victoria Road to The Crescent	Shared path	400 metres
	Connecting The Crescent to James Craig Road existing active transport network	Shared path	500 metres
Whites Creek Link Links Parramatta Road to the Rozelle Yards and onto Callan Park	Linking the intersection of Brenan Street and Railway Parade over City West Link connecting to the Rozelle Rail Yards Link	Bridge	200 metres

Route	Benefits	Type	Approximate length
Johnston Creek Valley link Extends the existing Johnston Creek pathway to connect Glebe Foreshore to Parramatta Road	Connecting Easton Park to The Crescent through the Rozelle Rail Yards	Bridge/shared path	300 metres
	Providing a suitable cycling space for the connection along The Crescent, into Jubilee Park and linking the existing Glebe Foreshore	Shared path	500 metres

Note:
1 This component would be delivered by the M4-M5 Link and UrbanGrowth NSW.

Existing active transport connections around the Rozelle Rail Yards are shown in **Figure C13-1**. Proposed temporary changes to active transport connections around the Rozelle Rail Yards during the construction of the project are shown in **Figure C13-2**. Active transport connections around the Rozelle Rail Yards for the operation of the project are shown in **Figure C13-3**.

The final design of the active transport links to be delivered by the project would be subject to detailed design and in accordance with UDLPs that would be prepared for the project. UDLPs would be prepared in consultation with stakeholders and the community and would be exhibited for public comment prior to the commencement of permanent built surface works and/or landscape works. The aim of the UDLPs is to present an integrated urban design for the project.

An Active Transport Network Implementation Strategy will be prepared for the project (see **Chapter E1** (Environmental management measures)). The strategy will be consistent with the Active transport strategy in Appendix N of the EIS. The strategy will be prepared in consultation with relevant councils and Bicycle NSW and implemented prior to the commencement of project operations or as otherwise agreed to by the Secretary of DP&E.

Active transport at The Crescent

There is an existing active transport connection at Buruwan Park which links Railway Parade to The Crescent under the Inner West light rail line bridge (see **Figure C13-1**). This connection would be temporarily removed during construction. Refer to Table 6-20 of the EIS and **Figure C13-2** for proposed modification to active transport connections during construction.

For the operation of the project, the connection under the Inner West Light Rail line bridge would be reinstated. This would connect Railway Parade to the realigned The Crescent and to the proposed pedestrian and cyclist bridge linking The Crescent and the Rozelle Bay Light Rail stop with the Rozelle Rail Yards over City West Link (see **Figure 13-3**).

The existing pedestrian bridge over Victoria Road east of the intersection of Victoria Road and The Crescent (identified as ‘Beatrice Bush Bridge’ by some submitters) would also be removed for widening and adjustments of Victoria Road between The Crescent and Anzac Bridge as part of the Rozelle surface works. Alternative routes for when the bridge is removed during construction are described in Chapter 8 (Traffic and transport) of the EIS and would be established before closure of the bridge. Refer to Table 6-20 of the EIS and **Figure C13-2** for proposed modification to active transport connections during construction.

The existing pedestrian bridge provides pedestrian and cyclist connectivity between Railway Parade/Bayview Crescent and The Crescent through to Lilyfield Road (via a separate pedestrian overpass to the north) and Anzac Bridge over Victoria Road from the shared path located to the south of City West Link towards The Crescent. These connections would be replaced by:

- A new east-west pedestrian and cyclist underpass below Victoria Road to connect Lilyfield Road with the opposite side of Victoria Road, Anzac Bridge and The Bays Precinct. This new link would offer improved visual amenity and safety and would remove the existing bridge structure over Victoria Road in the vicinity of White Bay Power Station

- North-south pedestrian and cyclist connections over City West Link via a new pedestrian and cyclist bridge over City West Link connecting Lilyfield Road and Easton Park with Brenan Street at Lilyfield
- North-south pedestrian and cyclist connections over City West Link via a new pedestrian and cyclist bridge over City West Link connecting Lilyfield Road and Easton Park with The Crescent at Annandale. The bridge would connect to the eastern side of The Crescent providing connectivity to the Glebe Foreshore and the western side of The Crescent providing connectivity through to the Rozelle Bay light rail stop.

Active transport connections around the Rozelle Rail Yards for the operation of the project are shown in **Figure C13-3**. The active transport connection through Rozelle Rail Yards would connect to the pedestrian and cycle underpass below Victoria Road. This link would connect with the existing shared path located to the north of Victoria Road towards Anzac Bridge.

While the proposed active transport connection at Rozelle would involve a slightly increased distance for pedestrians and cyclists travelling between Railway Parade and Anzac Bridge to bus stops on Victoria Road or other destinations, the connection would be associated with improved amenity through the open space at the Rozelle Rail Yards and would avoid two at-grade crossings at The Crescent and James Craig Road.Connection to the Glebe Foreshore during operation would be provided through the new bridge between Rozelle Rail Yards and The Crescent and shared path along The Crescent as well as at the existing at-grade pedestrian crossing at the corner of Johnston Street. The shared path would provide a suitable cycling space for the connection along The Crescent into Jubilee Park and linking to the existing Glebe Foreshore.

Active transport at Victoria Road

All existing signalised crossings on Victoria Road between Anzac Bridge and Iron Cove Bridge will be maintained. The design of the Iron Cove Link provides improved pedestrian and cyclist accessibility between Toelle Street and Terry Street, connecting Rozelle and Balmain. The portals have been located to allow a direct link between these streets that would provide a crossing over Victoria Road, with a pedestrian refuge in the centre of the road above the portals. The project is predicted to significantly reduce traffic volumes along Victoria Road south of Iron Cove which should facilitate improved pedestrian movements across this corridor and between Rozelle and Balmain.

An overpass would not be constructed over Victoria Road for the project. The existing overpass at Victoria Road near Lilyfield Road is required to be removed to widen Victoria Road in this location. An underpass is proposed beneath Victoria Road to replace the overpass as outlined in **Table C13-5**. Residents southwest of Victoria Road would access the bus stop opposite Hornsey Street via the new underpass. The underpass would be designed in accordance with relevant safety and accessibility requirements. Crossing Victoria Road via the underpass would involve generally the same time and distance compared to crossing the road via the existing overpass. The existing overpass at Victoria Road requires pedestrians and cyclists to climb stairs or use the ramp before and after crossing via the overpass before crossing over the road. The underpass would require generally the same movements. Pedestrian access to The Bay Run and King George Park would not change for the operation of the project. The Bay Run would be temporarily realigned during construction (refer to **Chapter D3** (Relocation of the bioretention facility at Rozelle) for further information).

Active transport at Darley Road

The existing access to the Leichhardt North light rail stop would be maintained for the project. Operational project infrastructure at Darley Road has been designed to reduce land-take and leave the central/eastern portion of the site, which is closer to the Leichhardt North light rail stop, to ensure access to the Rozelle Bay light rail stop is maintained and to provide for potential future development. The project would not impact the existing access in a way that would make the access noncompliant with the *Disability Discrimination Act 1992* (Commonwealth).

The pedestrian crossing on the northern side of Darley Road would be maintained for the project.

The support for the project is noted.

Active transport at Haberfield

The draft M4 East UDLP outlines the active transport links to be provided at Haberfield by the M4 East project.

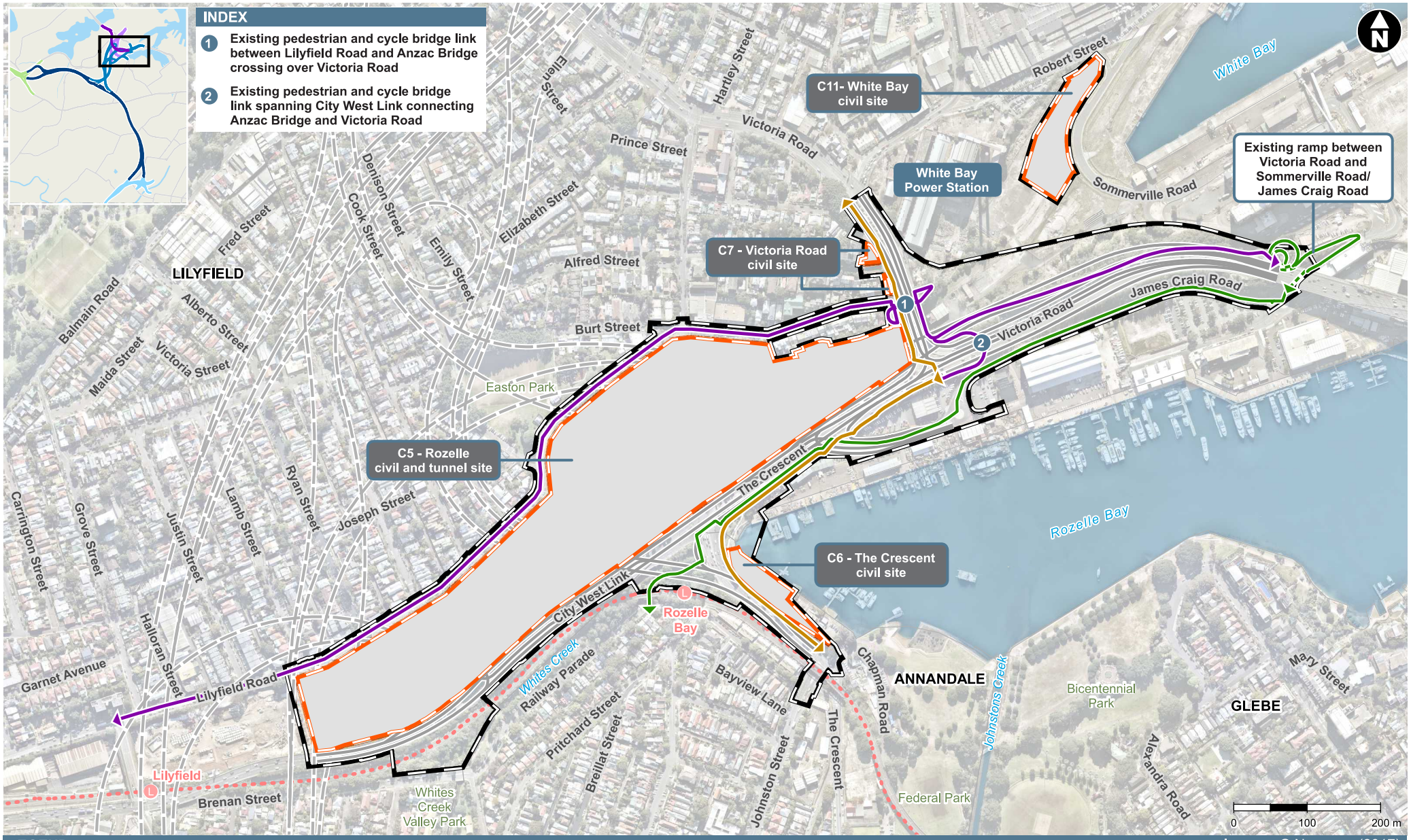

Figure C13-1 Existing active transport connections around the Rozelle Rail Yards

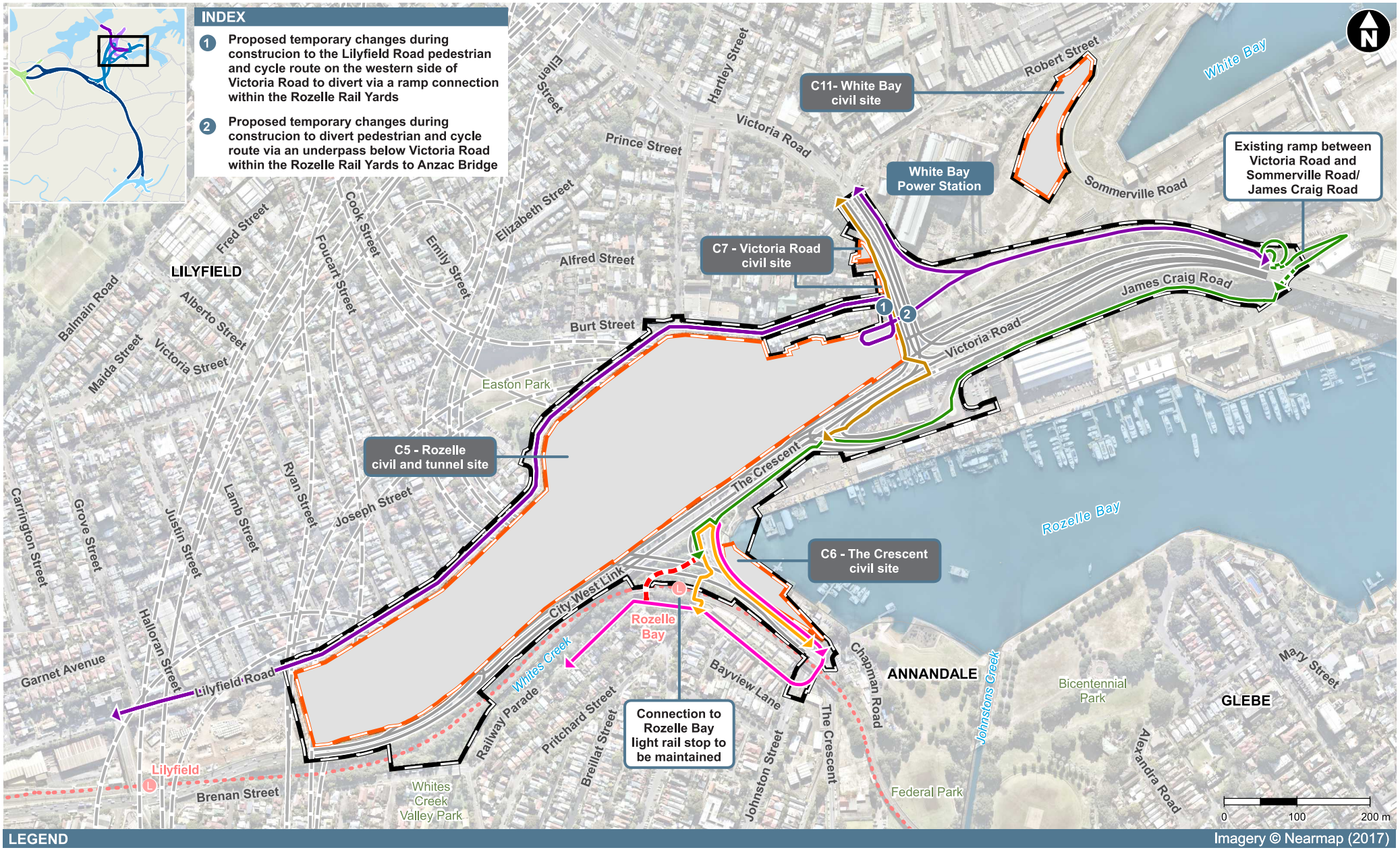

Figure C13-2 Proposed temporary changes to active transport connections around the Rozelle Rail Yards during the construction of the project

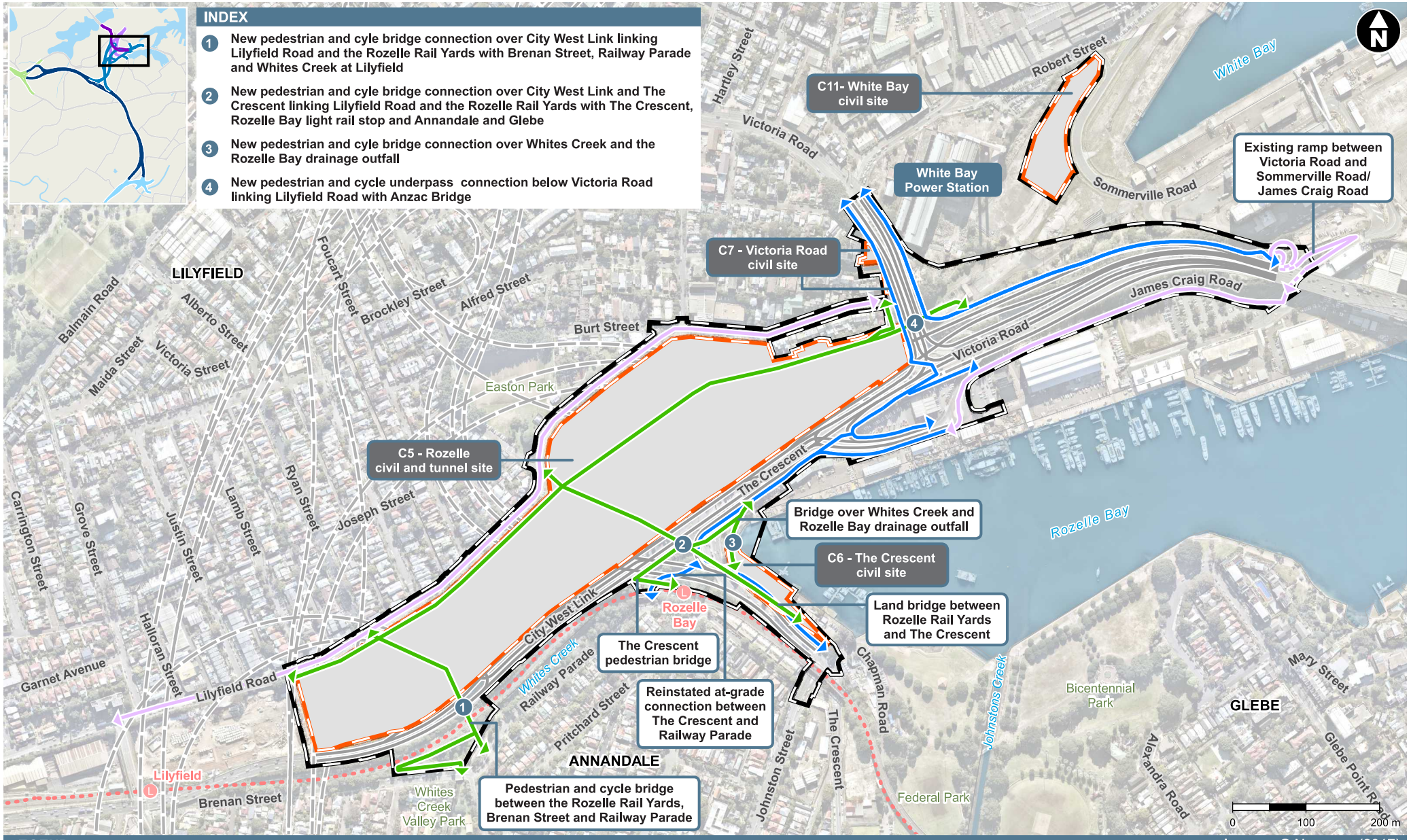

Figure C13-3 Active transport connections around the Rozelle Rail Yards for the operation of the project

C13.11 Cumulative urban design and visual amenity

Two submitters raised concerns about cumulative urban design and visual amenity impacts. Refer to section 26.4.5 of the EIS for details of cumulative urban design and visual amenity impacts .

C13.11.1 Removal of trees from multiple projects

Submitters were concerned that a large number of trees have already been removed for WestConnex and that more are going to be removed in Foucart Street and Cecily Street, Rozelle and in Lilyfield and Haberfield.

Response

The impacts of the WestConnex program of works and other related projects have been assessed for impacts to vegetation loss and consistent management measures have been identified. No native vegetation is to be removed as part of the M4-M5 Link project. The removal of trees would contribute to cumulative visual impacts to residents and motorists at Haberfield and Ashfield for the M4 East project and at St Peters for the New M5 project as, outlined in section 26.4.5 of the EIS.

As for the M4-M5 Link project, the UDLPs prepared for the interfacing areas at the Wattle Street interchange for the M4 East and St Peters interchange for the New M5 would include landscape works including revegetation and planting at key locations. As many trees as possible will be retained during the construction of the project. In the event that tree removal cannot be avoided, a tree replacement strategy will be prepared. Replacement trees will be included in the relevant UDLP.

C13.12 Urban design and visual amenity environmental management measures

242 submitters raised concerns about the urban design and visual amenity environmental management measures for the project. Refer to section 13.6 of the EIS for details of urban design and visual amenity environmental management measures for the project

C13.12.1 Urban design and visual amenity environmental management measures

Submitters raised concerns about urban design and visual amenity environmental management measures during the project. Concerns relate to:

- The EIS does not address the impacts of the project and there is a need to propose walls, plant and perimeter treatments and other measures at appropriate locations to lessen the impact on visual amenity
- All trees should not be removed unless sufficient investigations have been conducted. If trees are removed following investigation considerations then an approval needs to specify that all trees are replaced with mature native trees
- The proposed replacement trees are too small and are inadequate to compensate for the removal of the original trees
- What mitigation measures will be used to control light impacts at the Pyrmont Bridge Road tunnel site (C9) as the site will be active 24/7.

One submitter supported the commitment in the EIS that lighting during construction would adhere to established guidelines.

Response

The detailed design and construction of the M4-M5 Link project would be managed to ensure the identified landscape and visual impacts are minimised by implementation of a range of general and specific measures which are outlined in **Chapter E1** (Environmental management measures).

A range of urban design and landscape works are proposed for the project which are outlined in Chapter 13 (Urban design and visual amenity) of the EIS. The urban design and landscape works that would be carried out by the project would be documented in UDLPs. UDLPs would be prepared in consultation with stakeholders and the community prior to the commencement of permanent built surface works and/or landscape works and would present an integrated urban design for the project.

The concepts and principles outlined in the UDLPs would be developed into a detailed design for operational project infrastructure. The detailed design will be consistent with the project urban design principles (see section 13.2.2 of the EIS) and would include:

- Final land use for UDLP land
- Final design and material composition for built form structures
- Final landscape design
- Final heritage interpretation plan
- CPTED review of design.

Mitigation of impacts to trees

The detailed design and construction of the M4-M5 Link project would be managed to ensure that, as far as possible, the identified landscape and visual impacts related to the removal of trees are minimised and amenity is improved once the project is complete. This would be achieved through the implementation of a range of general and specific measures, including the implementation of urban design and landscape works as part of UDLPs (urban design and landscape works are summarised in section 13.5 of the EIS and throughout this chapter).

The arboricultural assessment at Annexure G of Appendix S (Technical working paper: Biodiversity) of the EIS provided a number of recommendations for tree protection to ensure that impacts of the project on trees are minimised following the hierarchy of avoid, minimise and mitigate as follows:

- A CFFMP will be developed and implemented during construction. The CFFMP will include measures to manage potential impacts to trees, including
  - The establishment of TPZs
  - Ground protection measures for trees to be retained
- As many trees as possible will be retained during construction. In the event that tree removal cannot be avoided, a tree replacement strategy will be prepared. Replacement trees will be included in the UDLP to be developed and implemented for the project.
- The CFFMP will include tree management protocols and provision for the development of tree management plans (in accordance with the requirements of AS 4970-2009) where required for specific trees. Protection of trees on development sites will be carried out in consultation with an arborist with a minimum AQF Level 5 qualification in arboriculture for each tree proposed for retention where works associated with the project have the potential to impact on the tree root zone.
- Pruning and maintenance work will be carried out by an arborist with a minimum AQF Level 3 qualification in accordance with *AS 4373-2007 Pruning of Amenity Trees* and the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998) and advice provided by an arborist with a minimum AQF Level 5 qualification in Arboriculture (or equivalent).

The size and species of replacement trees would be identified during the development UDLPs for the project and would be consistent with project urban design principles. Planting of mature and semi-mature trees will be considered for the project. Not all species of trees are conducive to transplanting, and this will be considered when developing plans to provide street trees as part of landscaping works. The project will aim to use tree species that will eventually provide appropriate levels of screening.

Mitigation of night lighting impacts

Site lighting at the Pyrmont Bridge Road tunnel site (C9) would be designed to minimise glare issues and light spillage at neighbouring properties and would be generally consistent with the requirements of Australian Standard 4282-1997 Control of the obtrusive effects of outdoor lighting.

The support for the commitment of the project to adherence to relevant lighting guidelines is noted.

C14 Social and economic

This chapter addresses issues raised in community submissions associated with the social and economic assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 14 (Social and economic) and Appendix P (Technical working paper: Social and economic) of the EIS for the further details on the social and economic assessment.

Contents

C14.1 Level and quality of assessment

1,025 submitters raised concerns about the quality of the social and economic assessment. Refer to section 14.1 of the EIS and Appendix P (Technical working paper: Social and economic) of the EIS for details of the social and economic assessment methodology.

C14.1.1 Adequacy of the social and economic assessment

Submitters raised concerns about the adequacy and independence of the social and economic impact assessment stating that there was inadequate information provided to gauge the real impact to residents and communities caused by the project. Submitters also believed that a social and economic assessment had not been conducted. Specific concerns include:

- The EIS is based on a concept design and therefore the assessment does not appropriately identify affected residents
- The company that conducted the social and economic impact assessment has a conflict of interest due to their involvement in property valuation and development in affected areas, and their involvement in the two preceding stages of WestConnex
- Table 5-27 in Appendix P details the preferred modes of travel to work in the Leichhardt-Glebe precinct. However, these numbers are from 2011 and are outdated, particularly in regards to the figures for rail
- Labelling of people affected by the project as ‘receivers’ dehumanises those affected
- The EIS does not assess the social disruption in communities in relation to property acquisitions, specifically the impact on communities from the acquisition of local shops, in Haberfield and Ashfield
- The social and economic assessment does not include the difficulties that residents or other property owners could face in relation to redress for property damage from vibration
- The EIS is misleading because it discusses the number of jobs created for construction works while omitting the number of jobs that would be lost due to acquisition of businesses
- The assessment methodology for identifying impacts to businesses during construction is not adequate, including the level of transparency in this assessment
- The assessment did not consider impacts between 2023 and 2033 (during operation)
- The impact of traffic exiting the mainline tunnels and entering local roads throughout the inner west (including Haberfield, Ashfield, Newtown, Enmore and Alexandria) has not been adequately assessed
- The EIS ignores amenity impacts on the community, including at St Peters interchange
- The EIS does not adequately explain or address the social cumulative impacts of the broader WestConnex program of works. No research was conducted on the current experiences of residents living with impacts from construction, particularly construction impacts to residents at Haberfield and St Peters as a result of the M4 East and New M5 projects. Without this data, the EIS makes incomplete and inadequate predictions of social and economic impacts
- Concern regarding the lack of reference made to M4 East and New M5 construction impacts for the social and economic impact study. The only reference made is to construction fatigue, which is not adequate enough for the impacts on health, noise and the destruction of relationships
- What evidence is there that business impact surveys were conducted at Ashfield and Haberfield?
- The study refers to the overall construction impact on the Inner West LGA as 'moderate' but makes no attempt to quantify this negative impact either in terms of the costs to households or lost productivity
- The EIS does not evaluate what the cumulative social and economic impacts of a hybrid option for construction sites at Haberfield and Ashfield are on the community
- The impact of the project on liveability has not been addressed

- This EIS has not properly analysed the social and economic impacts of the whole project on residents and businesses which will be forced to leave their current locations, or the impact on those who will be left on the perimeters of the proposed toll road on roads including King Street at Newtown or The Crescent at Annandale.

Response

Preparation of EIS and social and economic impact assessment

The EIS was prepared by a team of qualified professionals and presents a balanced, merit-based environmental impact assessment in accordance with the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) and applicable NSW assessment policies. The EIS included the preparation of a range of comprehensive technical studies including the social and economic impact assessment (SEIA). These technical studies were prepared in accordance with the key issues identified in the Secretary's Environmental Assessment Requirements (SEARs), which included requirements issued by key government agencies as well as industry standards and guidelines. The EIS, including detailed technical studies, was reviewed by the NSW Department of Planning and Environment (DP&E) and key NSW Government agencies to confirm that it addressed the SEARs prior to being finalised and placed on public exhibition.

The SEIA was also undertaken in accordance with the Roads and Maritime *Environmental Impact Assessment Practice Note: Social and economic assessment* (Roads and Maritime 2013), as required by the SEARs. The practice note provides a framework for assessing social and economic impacts to ensure these assessments are carried out consistently, to a high standard, and are properly integrated with other environmental assessments, design development and management processes.

The assessment of a concept design in an EIS is a common approach and has been applied to other recent major infrastructure projects in NSW including Sydney Metro City and Southwest and Central Business District (CBD) and South East Light Rail. While the SEIA is based on a concept design, the study area for the assessment is broader than the project footprint, thereby capturing a larger number of potentially affected people, communities and businesses. The study area for SEIA is shown in Figure 14-1 of Chapter 14 (Social and economic) of the EIS.

Should the final tunnel alignments and project sites developed during detailed design identify potential receivers that were not assessed in the EIS, further separate environmental assessment would be undertaken, if required, under the EP&A Act. Further information on the preparation of the EIS based on a concept design is included in **Chapter C2** (Assessment process).

This SEIA was undertaken by the planning team of HillPDA however, HillPDA was not involved in preparation of the SEIAs for the New M5 or M4 East EISs. While HillPDA has a property valuation capability, the valuation team within HillPDA was not involved in, and has not influenced in any way the preparation of Appendix P (Technical working paper: Social and economic) of the EIS.

See **section C14.4.2** for a response to the issue regarding the potential loss of jobs as a result of the acquisition of businesses.

Language and data used in the SEIA

The journey to work data from 2011 included in Table 5-27 of Appendix P (Technical working paper: Social and economic) of the EIS represents the most current data available at the time of writing the EIS. The data is informed by the 2011 Census from the Australian Bureau of Statistics. A complete set of the data from the 2016 Census had not been published at the time of writing the EIS, and only a summary was available.

The use of 'receivers' is standard terminology in environmental impact assessment in NSW. The use of this term is not intended to distance the project from affected people, businesses and/or communities, but to ensure the consistent use of terminology throughout separate sections of the assessment. The term is also used in the SEARs for the project as issued by DP&E.

Construction impact assessment

The social and economic impacts arising from property acquisition are described in section 7.3 of Appendix P (Technical working paper: Social and economic) of the EIS. The EIS recognises that there would be major impacts on individuals, businesses and social infrastructure as a result of property acquisition; although it also recognises that the number of acquisitions is low for an infrastructure project of this scale. The project has been designed to minimise the need for property acquisition and the number of property acquisitions around Haberfield are limited.

All property acquisition undertaken by the NSW Government is in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW) and the reforms announced in October 2016 (NSW Government 2016b). Information about the property acquisition process and the reforms can be viewed online[1].

The reforms were implemented as a result of a review of the existing acquisition process, which demonstrated that although the legislative framework for land acquisitions was sound, there was more work to be done to ensure that a stressful and complex situation is made as easy as possible. The new approach has a greater focus on providing support to affected residents and business owners with their relocation. Each property owner or tenant is now assigned a Personal Manager as a consistent point of contact throughout the acquisition process and to provide relocation assistance. Property owners must now be given at least six months to reach a compensation agreement before the compulsory acquisition process can start.

The overall impact of property acquisition on the social and economic environment was considered to be a minor negative impact given the relatively low number of acquisitions, noting that the impact on individual affected residents and businesses would be major, however, somewhat mitigated by the implementation of the reforms described above and the environmental management measures PL1, and SE2 to SE6 in **Chapter E1** (Environmental management measures). Impacts on other social and economic elements of the community such as community cohesion, community safety and health, demographics, local amenity and community identity and character, were also assessed and are not expected to be substantially affected by the project based on the relatively low number of acquisitions.

St Peters was included in the technical working papers prepared to support the EIS. Potential impacts to the amenity of St Peters were assessed with regard to traffic, air quality, noise and vibration, human health, visual and social and economic impacts with an assessment against both construction and operation of the project, in section 7.2 and section 8.2 of Appendix P (Technical working paper: Social and economic) of the EIS respectively.

Regarding potential impacts to businesses from property acquisitions, the EIS acknowledges the potential for job losses associated with property acquisition (refer to section 7.3.2 of Appendix P (Technical working paper: Social and economic)), however the EIS does not state the number of jobs potentially affected by these acquisitions as these changes are generally very difficult to accurately predict. The acquisition of a business property does not directly correlate to job losses as some businesses may relocate or transform their services. The degree of impact upon any particular business would be highly variable according to the business type, industry, location, customer base, size and connectivity with other outlets. In addition, the personality and nature of particular business operators may mean that certain businesses are more flexible than others in dealing with disruptions, further complicating the potential for accurate prediction of specific impacts such as job losses.

The SEIA was prepared in accordance with *Environmental Impact Assessment Practice Note - Socio-economic assessment* (EIA-N05), which provides guidance on the steps to be undertaken when assessing potential impacts to businesses, including passing trade, parking, servicing and deliveries, employment and recruitment, business access, connectivity and amenity. Around 29,000 businesses were identified in the social and economic study area with the Alexandria and Erskineville precincts containing the largest number of businesses and being the largest employment precincts (refer to Figure 14-1 of Chapter 14 (Social and economic) of the EIS)).

Business surveys were conducted within 400 metres of construction ancillary facility sites at Rozelle and Lilyfield over a two-week period in November 2016 (refer to Annexure A of Appendix P (Technical working paper: Social and economic) of the EIS). The survey provided businesses the opportunity to raise concerns related to the project. Around 100 businesses participated in the survey, comprising local retailers, commercial operators and other businesses. Businesses around the construction ancillary facility sites at Haberfield and St Peters were not included within the survey as perceptions and concerns were collected during the M4 East and New M5 projects.

The sensitivity of business clusters and vulnerability of businesses to potential impacts includes consideration of (refer to section 7.9 of Appendix P (Technical working paper: Social and economic) of the EIS):

- Passing trade
- Employee and customer access and travel time

[1] www.propertyacquisition.nsw.gov.au

- Customer and employee parking accessibility
- Servicing and deliveries
- Ambience
- Employee productivity and communication capacity
- Business visibility
- Demand for services.

A Business Management Plan would be prepared and would identify businesses that have the potential to be adversely affected by construction activities that would occur as part of the project and management measures that would manage these potential impacts. These would be determined in consultation with the owners of the identified businesses.

During construction, vibration effects on local amenity would be intermittent in nature and short-term at any particular receiver. An assessment of the potential social and economic impacts of property damage from vibration is specifically addressed in section 7.2.1 and section 8.2.2 of Appendix P (Technical working paper: Social and economic) of the EIS. Measures to avoid, and where the impact cannot be avoided, to manage potential damage to property and measures to rectify property damage caused by the project, are provided in full in **Chapter E1** (Environmental management measures) and summarised in **Chapter C12** (Land use and property). These measures include preparation and implementation of a Construction Noise and Vibration Management Plan (CNVMP) for the project, vibration monitoring and further location and activity specific noise and vibration assessment.

The minimisation and rectification of incidental damage to property during the construction of the project due to general construction activities such as the movement of mobile plant or heavy construction vehicles would be the responsibility of the design and construction contractor(s) for the project.

Operational impact assessment

For operational impacts, the SEIA has assessed the impacts of an operational project scenario at opening in 2023 and at ten years after opening in 2033, based on the outcomes of the traffic modelling undertaken for the EIS. The year 2033 was selected as representative of a future scenario based on the Roads and Maritime *Traffic Modelling Guidelines 2013.* A 10 year assessment of operation of the project (year of opening plus 10 years) is standard assessment approach for major road infrastructure projects and is consistent with the assessment approach adopted in the M4 East EIS and New M5 EIS.

The EIS considered the social and economic impacts arising from operational changes to traffic on local roads throughout the inner west (including Haberfield, Ashfield, Newtown, Enmore and Alexandria) (refer to sections 7.1.1 and 8.1.1 of Appendix P (Technical working paper: Social and economic) of the EIS). The assessment concluded that this impact would have a minor negative impact on the surrounding community. These impacts would be offset by the improved connectivity, reduced travel times, increased reliability and safety, and reductions in traffic on some parallel routes once the project is operational.

Cumulative impact assessment

Cumulative social and economic impacts of the WestConnex program of works are summarised in Chapter 26 (Cumulative impacts) of the EIS. The SEIA addressed potential cumulative effects including construction fatigue, particularly in areas subject to construction impacts from the M4-M5 Link project and other WestConnex component projects, such as the M4 East and New M5 projects at Haberfield/Ashfield and St Peters respectively. Feedback from other Sydney Motorway Corporation (SMC) project teams, design and construction contractors and DP&E was sought on the M4 East and New M5 construction phases to identify lessons learnt and areas for improvements to work processes and mitigation measures to assist in addressing potential cumulative impacts. Further information regarding the assessment of cumulative impacts at Haberfield and St Peters is included in the response in **section C14.12.1**.

Multiple community and stakeholder consultation sessions were held for the M4-M5 Link project prior to and during preparation of the concept design report and EIS, and throughout the submissions report process for the project. This included hosting sessions in Haberfield and St Peters, where communities currently being affected by the M4 East and New M5 construction works were able to provide feedback to the project team. A detailed summary of community and stakeholder consultation undertaken for the project is included in Chapter 7 (Consultation) of the EIS. Future consultation for the project is discussed in **section A2.5**.

C14.1.2 Assessment of social and economic impacts of tolling

Submitters were concerned that the social and economic assessment did not adequately assess the impacts of tolling or toll avoidance (and its link to cost of living pressure) on the community. Other concerns raised by the community included:

- There is no analysis of equity impacts of the infrastructure investment and the tolling regime, given the lower social and economic status of many areas of western Sydney, and the requirement for potential users of WestConnex to own or pay for access to a private vehicle to be able to use it
- The EIS does not accurately reflect evidence of the impact of tolls on less advantaged communities, although it does acknowledge it as a problem, it makes no attempt to consider the long-term impacts on the cost of living for drivers of decades of escalating tolls
- The investigation and analysis of the impact of tolls is not adequate and underestimates the social, economic and health burden it would place on residents for decades to come.

Response

The SEARs require the traffic assessment for the project to forecast travel demand and traffic volumes with consideration of toll avoidance. The value of travel time savings to different vehicle users, in terms of their willingness to pay tolls, is factored into the WestConnex Road Traffic Model (WRTM) that informed the traffic and transport assessment for the project (as described in section 9.8 of Appendix H (Technical working paper: Traffic and transport) of the EIS). The SEIA is informed by the traffic and transport assessment and therefore considers toll avoidance.

To assess the values that differing vehicle users place on travel time savings, a project specific survey was designed and conducted in Sydney in 2013 asking road users questions about their willingness to pay tolls. Independent specialist peer reviewers provided oversight throughout the design and analysis of the survey. The survey yielded a distribution of estimates of the value that Sydney drivers are willing to pay in terms of tolls to reduce their travel time. These values were benchmarked against values from other studies in Australia and internationally. The survey results are used within the WRTM's route choice algorithm to represent the influence of a toll.

The SEIA does indicate that lower income households in western Sydney may not be able to afford the tolls for the M4-M5 Link ($6.50 in 2017 dollars). However, the WestConnex program of works, which includes the project, would provide good value for commuters from western Sydney to the Sydney CBD as it would be capped at $8.60 (2017 dollars) for cars and light commercial vehicles, once all WestConnex component projects are operational (by 2022). The cap would come into effect after at least 16 kilometres of travel on the motorway. A cap on the toll provides certainty to users about the costs and improves the overall value for money to the community. On this basis the EIS considered the overall social and economic impact to be moderate positive.

Free, alternative traffic routes, such as Parramatta Road, City West Link, King Georges Road, the Hume Highway, Stanmore Road, Sydenham Road and the Princes Highway, would remain available to those who choose not to use the tolled motorway. Motorists who choose to use the existing surface road network would still benefit as the capacity on these alternative routes is forecast to improve (as freight and commercial vehicles are expected to use the motorway tunnels). Individuals will have to weigh up the benefits of using the motorway, which includes travel time savings, a safer option with lower potential for traffic accidents and reduced vehicle operation and maintenance costs, with the financial cost of using the motorway. Further information regarding the potential impacts associated with tolling is included in **section C14.9.2** including the announcement of a vehicle registration cashback scheme for motorists who spend more than $25 on average a week over a 12 month period on tolls in NSW to claim free vehicle registration by the NSW Premier.

C14.1.3 Assessment of social infrastructure

Submitters raised concerns with the assessment of impacts on social infrastructure. The following concerns were raised:

- The Minister of Education was not consulted
- Impacts to schools have not been adequately assessed
- Impacts associated with loss of amenity from reduced access to open space should have been accounted for.

Response

As outlined in Chapter 7 (Consultation) of the EIS, the Department of Education was consulted during the development of the EIS.

The SEIA provided an assessment of impacts on community facilities resulting from the construction and operation of the project. A comprehensive list of community facilities identified within the SEIA study area was provided in the EIS (refer to section 5.2 of Appendix P (Technical working paper: Social and economic). The study area contained a wide range of educational facilities, including 50 primary schools and 15 secondary schools. Potential impacts to educational facilities in the vicinity of the project footprint, such as Rozelle Public school, Haberfield Public School and the Bridge Road School have been assessed in Chapter 7 of Appendix P (Technical working paper: Social and economic) of the EIS.

To minimise the consequence and likelihood of impacts on social infrastructure, a Social Infrastructure Plan and Community Communication Strategy would be prepared and implemented to avoid, minimise and manage avoid potential construction effects. See **Chapter E1** (Environmental management measures) for further information regarding measures to manage potential social and economic impacts.

Further concerns raised by submitters regarding potential impacts to social infrastructure including schools are responded to in **section C14.3.2**. See **section C14.3.1** for a response regarding the loss of open space at Buruwan Park and a small part of King George Park, and how this would be offset by new open space at Rozelle. Issues with access and connectivity are discussed in **section C14.2.2**.

C14.2 Community impacts during construction

1,876 submitters raised concerns about changes in the community as a result of construction of the project. Refer to section 14.3 of the EIS and Appendix P (Technical working paper: Social and economic) of the EIS for details of potential changes to the community as a result of construction of the project.

C14.2.1 Community values

Submitters raised concerns that tunnelling, pollution and disruption during long-term construction of the project would result in general impacts to local communities including impacts on culture, local character, liveability, quality of life, lifestyle and sense of worth of community.

Specific concerns mentioned in submissions include:

- Community cohesion, liveability and residents' quality of life would be affected by construction
- Long term construction timelines would cause a disruption and inconvenience to people's lives
- General concerns regarding impacts to communities.

Specific areas mentioned included the areas around the Option A and B sites at Haberfield and Ashfield, Pyrmont Bridge Road tunnel site (C9) site, the inner west and the suburbs of Annandale, Ashfield, Haberfield, Leichhardt, Lilyfield, Rozelle, St Peters and surroundings suburbs.

Response

Given the project's size, duration and complexity, construction would generate a range of social and economic impacts. In response to community concerns and design constraints identified during the preparation of the EIS, a number of substantial changes have been made to the project design (refer to Chapter 4 (Project development and alternatives) of the EIS). Project design alterations to reduce potential social and economic construction impacts include:

- Adjustment of the project footprint to avoid using Easton Park at Rozelle during construction and to minimise impact on Lilyfield Road and the heritage listed Sydney Water sewerage pumping station
- Adjustment of the project footprint to avoid using areas around Blackmore Park, Leichhardt during construction
- Removal of a potential construction site in Derbyshire Road, Leichhardt, adjacent to Sydney Secondary College (Leichhardt Campus) to prevent amenity, traffic and heritage impacts
- As a result of the deletion of the Camperdown interchange, adjustment of the mainline tunnel alignment further to the west which has avoided construction impacts on the Royal Prince Alfred Hospital and the University of Sydney
- The selection of spoil haulage routes to primarily follow the arterial road network and avoid local roads
- The restriction of hours for spoil haulage from the Darley Road civil and tunnel site (C4) to standard construction hours to avoid noise, traffic and amenity impacts on local residents.

The SEIA acknowledges and assesses the potential construction impacts of the project. Where possible, these issues have been minimised by adopting the design alterations outlined above, or appropriate management measures have been identified to reduce the impacts during construction. The design and proposed management measures have also been informed by lessons learnt from the implementation of preceding WestConnex component projects that are currently operational or under construction, to ensure that impacts are thoroughly considered and management measures are feasible and reasonable.

The key impacts to community values identified in the SEIA as a result of construction include property acquisition and changes to neighbourhood identity and character, community safety and health, and community cohesion. The SEIA has assessed these impacts with consideration of the overall duration of construction for the M4-M5 Link project. The property acquisition impacts from the project are reduced by comparison to the M4 East and New M5 projects, being largely confined to NSW Government owned land and land within footprint of the M4 East and New M5 projects which has minimised the need for property acquisition.

With respect to community identity and character, construction impacts for the M4-M5 Link project would be mainly contained in proximity to the proposed construction ancillary facilities. Areas further afield such as the Sydney CBD and other areas of the inner west (such as those to the east of Haberfield/Ashfield), are unlikely to be substantially affected by the construction of the project.

Key features of community character that would be affected by the project include:

- Vegetation – Trees contribute to the identity of a neighbourhood, provide protection from the elements and provide intermittent or consistent screening and privacy. The vegetation to be removed by the project is modified and disturbed and comprises exotic species, weeds and planted species. The Urban Design and Landscape Plans (UDLPs) that would be prepared and implemented for the project would guide the compensatory planting for trees removed by the project. New open space provided at Rozelle would also be vegetated and provide a new open space for the communities in and Rozelle and Lilyfield and surrounds
- Public art and monuments – Two items are located in the project footprint; the statues of soldiers on the approaches of Anzac Bridge and the mural along The Crescent between City West Link and Johnston Street. These items of public art would be retained and protected during construction of the project
- Heritage places – Heritage impacts include the demolition of three statutory heritage items of local significance (with one item being partly demolished), a minor encroachment into the State Heritage Register listed White Bay Power Station curtilage (with no direct impact on the associated buildings) and the demolition of some items considered to be potential heritage items.

These impacts would be managed via archival recording, salvage of heritage items and the implementation of a heritage interpretation strategy.

To further manage the impacts associated with longer duration construction impacts from the concurrent construction of the WestConnex component projects in these areas and to respond to issues raised during the construction of other WestConnex component projects and in submissions on the M4-M5 Link EIS, the following strategies are proposed:

- Provision of additional off-street car parking for the construction workforce at Rozelle, with the use of the White Bay civil site which would provide around 50 parking spaces. This site is further described in **Chapter D2** (White Bay civil site (C11))
- Using the Northcote Street civil site (C3a) for construction workforce car parking and laydown. Currently this site is used as the main tunnelling site for the eastern end of the M4 East project
- Reducing the surface construction footprint of the Wattle Street civil and tunnel site (C1a) to limit surface construction activities to the Wattle Street entry and exit ramps. Compared to the indicative layout presented in Chapter 6 (Construction work) of the EIS for this site, this would reduce potential construction impacts such as noise and vibration and dust during construction of the M4-M5 Link project and would also allow for realisation of the M4 East urban design and landscaping outcome for this area at the completion of the M4 East project
- Provision of a heavy vehicle truck marshalling facility at the White Bay civil site at Rozelle, which would cater for around 40 heavy vehicles and stage the release of trucks to the tunnelling sites to manage the arrival of trucks to construction ancillary facilities (see **Part D** (Preferred infrastructure report)). Provision of a truck marshalling facility and additional construction workforce parking would result in several benefits for the community and the project, including:
  - Reducing potential queuing, idling, circling and congestion on local roads surrounding the project and associated construction ancillary facilities
  - Providing additional construction workforce parking spaces, which would minimise construction workers parking on local roads
  - Minimising disruptions to the road network around construction ancillary facilities and noise and other disturbance to the local community including residential, business and commercial properties
  - Improving safety for construction workers, motorists and the general public by providing a controlled area from which project traffic schedulers can manage trucks and direct truck drivers to the construction sites at an appropriate time
- Development of a car parking strategy that will quantify construction workforce parking demand, identify public transport options (and measures such as carpooling and shuttle-buses) and identify all locations that will be used for construction workforce parking (see environmental management measure TT04 in **Chapter E1** (Environmental management measures))
- Development and implementation of a truck management strategy that will identify potential truck marshalling areas that will be used for the project and describe management measures for project-related heavy vehicles to avoid queuing and site-circling in adjacent streets and other potential traffic and access disruptions (see environmental management measure TT16 in **Chapter E1** (Environmental management measures))
- Designing acoustic sheds with consideration of the activities that will occur within them and the relevant noise management levels in adjacent areas. Monitoring will be carried out to confirm that the actual acoustic performance of the sheds is consistent with predicted acoustic performance (see environmental management measure NV7 in **Chapter E1** (Environmental management measures))
- The appointment of a suitably qualified and experienced acoustics advisor, who is independent of the design and construction personnel, and who will be engaged for the duration of construction of the project (see environmental management measure NV1 in **Chapter E1** (Environmental management measures))
- Use of the M4 East and New M5 tunnels for spoil haulage when they become available and where practicable, to minimise heavy vehicle movements on the surface road network
- Consideration of receivers that qualify for assessment for at-receiver treatment due to predicted operational road traffic noise that are also predicted to experience exceedances of noise

management levels during construction for at-receiver treatments as a priority (see environmental management measure NV9 in **Chapter E1** (Environmental management measures)).

Specific management and mitigation will be documented in relevant construction environmental management sub-plans such as the Ancillary Facilities Management Plan and the Construction Traffic and Access Management Plan (CTAMP). This will include detailed consideration of the types of activities that would be most likely to cause longer duration impacts during construction of the project, the types of impacts already experienced by these communities as a result of M4 East and New M5 construction, and subsequent development and implementation of location and activity specific mitigation that considers the consecutive nature of construction at these locations.

See **section C14.12** for a response to the issue of longer duration construction impacts from multiple projects.

C14.2.2 Access, connectivity and community cohesion

Submitters raised concerns that construction of the project would impact on community cohesion through changes to access and connectivity, specifically in the Inner West. Submitters raised concerns that the project would result in segmentation of communities. Specific concerns included:

- Plans for family members to move closer to their family residing in areas affected by construction, such as Haberfield, would no longer be viable due to construction
- How students from Rozelle Public School would be able to walk to school, and participate in important school events such as the cross country and athletics carnival, held at King George Park, and the school swimming carnival at Drummoyne Pool
- Active travel would be impacted by construction at Rozelle and Annandale, particularly for residents who have reduced mobility
- The project will impair community links within Haberfield, between Haberfield and Ashfield and between Haberfield and Five Dock, through increased traffic volumes during construction
- The project will impede access from Haberfield Public School to Timbrell Park
- The project would geographically divide Rozelle even more
- The additional volume of trucks from the Rozelle civil and tunnel site (C5), The Crescent civil site (C6) and the Pyrmont Bridge Road tunnel site (C9) is going to lead to congestion on Johnston Street and The Crescent towards Ross Street which would impact access for residents to their local area
- Closure of the Victoria Road pedestrian bridge and the closure/relocation of the nearby bus stops for significant periods of time would impact resident's access to the CBD via active or public transport
- The project would divide communities at Parramatta Road and Wattle Street
- Temporary changes to vital cycling/pedestrian routes would be for four years at Annandale and Rozelle that would make cycling and walking more difficult, especially for residents with reduced mobility
- Construction works at Callan Street, Springside Street and McCleer Street would impact access to homes and King George Park.

Response

A number of the larger arterial roads, including City West Link, Victoria Road, Parramatta Road and the Princes Highway currently operate as physical and psychological barriers between communities in the Inner West. These roads carry large volumes of traffic, with motor vehicles generally prioritised over pedestrian and cyclist connections. Rozelle Rail Yards, City West Link, the light rail corridor and Whites Creek act as a substantial physical barrier between the communities of Annandale, Rozelle and Lilyfield. The Rozelle Rail Yards also currently acts as a significant physical barrier between the communities of Annandale, Rozelle and Lilyfield.

The SEIA recognises that during construction, temporary changes to the road and active transport network, particularly along City West Link, Victoria Road, The Crescent, and Lilyfield Road may contribute to community severance and disconnection.

The additional volume of heavy vehicles on Parramatta Road and Wattle Street during construction is not anticipated to significantly impact on mid-block level of service (LoS) and intersection LoS. Heavy vehicles will have the opportunity to use the M4 east tunnels on Wattle Street and Parramatta Road once they are open to reduce impacts to the surface road network. All existing signalised pedestrian crossings of these roads will be maintained and no permanent infrastructure is proposed at Haberfield or Ashfield as part of M4-M5 Link project that would impact on connectivity.

Chapter D2 (White Bay civil site (C11)) describes an additional ancillary facility at Rozelle that would be used primarily to support truck marshalling for spoil haulage vehicles and construction workforce parking for construction of the project. **Appendix A** (Traffic and transport impact assessment) assesses the potential impacts of this site and includes an additional heavy vehicle access route for heavy vehicles accessing the Pyrmont Bridge Road tunnel site (C9) from the White Bay civil site (C11) along Johnston Street. The assessment determined that the additional volume of heavy vehicles on Johnston Street during construction would have a negligible impact on the roadway LoS when compared to the 'Without construction' scenario. The assessment of intersection operational performance showed negligible change, except in the PM peak for The Crescent/Johnston Street/Chapman Road intersection, showing a change in LoS (from LoS C to LoS D).

Changes to existing pedestrian and cycling facilities are detailed in section 6.6.2 of the EIS. Students of Rozelle Public School would be able to access King George Park by crossing Victoria Road, either at Wellington Street or Terry Street and using local streets, or by crossing under Iron Cove Bridge (via the existing pedestrian path). Drummoyne Pool would also be accessible by travelling along the northern side of Victoria Road and across Iron Cove Bridge on either the north or south side of the bridge. A temporary diversion would be established for pedestrians and/or cyclists wishing to travel along the southern side of Victoria Road during construction, with access being maintained.

The Bay Run connection between King George Park and Iron Cove Bridge would be maintained during construction, with temporary diversions around the construction area within King George Park provided. This would include a temporary connection between King George Park and the shared path on Iron Cove Bridge. Following the completion of construction, the connection between the Bay Run and Victoria Road and Iron Cove Bridge would be reinstated in generally the same arrangement as existing.

Any changes to pedestrian and cyclist routes would ensure safety and maintenance of existing routes and ease of access for all levels of mobility, while minimising detour distances. In addition, all efforts would be made to minimise disruption to pedestrian and cyclists and to maintain network legibility by transferring from the existing infrastructure to the new infrastructure as soon as possible.

To reduce the impact on pedestrian and cyclist connections, a strategy for the maintenance of pedestrian and cyclist access during construction, and information regarding alternative travel routes, would be prepared during detailed design. These measures would form part of the CTAMP and would include:

- Specifications around the standards of pedestrian and cyclist environments (around construction sites and on alternative routes)
- Provisions that ensure the maintenance of access for all levels of mobility
- Information regarding alternative travel routes including the difficulty of terrain, the additional distances and the duration of detours
- Construction signage clearly identifying the detour routes and locations for alternative crossings.

See **Chapter E1** (Environmental management measures) for a full list of management measures to mitigate impacts to community cohesion.

Once construction is completed, parts of the Rozelle Rail Yards would be redeveloped as public open space. This additional open space area would provide the communities in Rozelle, Annandale and Lilyfield with increased access to active and passive recreation facilities and would substantially increase connectivity. This would include a pedestrian and cyclist 'land bridge' that would provide a north-south connection between Bicentennial Park, the Rozelle Rail Yards and beyond to Easton Park, as well as connecting to the Rozelle Bay light rail stop, thereby improving public transport options for the residents of Lilyfield and Rozelle. This would provide significant opportunities for the connection of these communities, which have been separated by the rail yards for over 100 years. In addition, the project would provide another north-south active transport link further west of the 'land bridge' that would link Lilyfield Road to the Whites Creek corridor.

The existing pedestrian and cyclist overpass over Victoria Road, near Lilyfield Road, would be removed during construction. Prior to the removal of this bridge, alternative east-west access for pedestrians and cyclists would be provided below Victoria Road via an underpass. This underpass would connect Lilyfield Road and the western side of Victoria Road to the existing pedestrian and cyclist path that continues over the Anzac Bridge, as well as to the eastern side of Victoria Road. This underpass would be subsequently adapted to form the new permanent east-west connection below Lilyfield Road.

As outlined in **Chapter D3** (Relocation of the bioretention facility at Rozelle), it is proposed to relocate the bioretention facility at Rozelle around 150 metres north of the location presented in the EIS, to an area adjacent to Victoria Road at the eastern abutment of Iron Cove Bridge and within King George Park (see **Figure D3-1**). Further information is provided in **Chapter D3** (Relocation of the bioretention facility at Rozelle). Relocating the bioretention facility would mean that local roads would not be used to access the previous location proposed for the facility adjacent to Manning Street. Access to the relocated facility would be via Victoria Road or the Iron Cove Link civil site (C8). Where feasible, trucks would not use adjacent local roads including Byrnes, Clubb, Toelle, Callan and Manning streets, for site access. This would minimise impacts to parking and access along these streets. Access to residential properties along these local roads and to King George Park may be temporarily disrupted during construction; however access would be maintained.

C14.2.3 Reduced amenity

Submitters raised concerns about general loss of amenity and inconvenience during construction, including disruption and disturbance to residents near construction sites. Amenity impacts were raised in regards to general pollution, noise, vibration, dust, soil, night works, utility works, construction parking and increased traffic. Areas mentioned in submissions included:

- Residents living in the inner west (including Rozelle, Leichhardt, Annandale and Haberfield, Newtown and Green Square)
- Areas around the Rozelle and St Peters interchanges, and the Iron Cove Link tunnel portals, including Wellington Street and Victoria Road)
- Areas near construction sites in general
- Family and Community Services properties
- Areas around Edna and Paling streets in Lilyfield
- Areas around Alt Street, Ilford Avenue and Bland Street in Haberfield and Ashfield
- Parramatta Road, City West Link, Wattle Street, The Crescent (in relation to heavy vehicle movements).

Specific concerns included:

- Impacts to outdoor spaces, swimming pools, private gardens and backyards
- Construction noise and traffic impacting:
  - The ability of children to learn and/or study
  - The ability of children to sleep
  - The ability of residents and employees to work, including shift workers
- Impacts to the way in which people can use space
- Affect people's ability to communicate and the way in which individuals undertake ordinary daily routines, such as gardening
- An increase in pollution, including dust, dirt, soil and grit, particularly around Darley Road
- Construction dust impacting swimming pool filtration systems.

In regards to the Darley Road civil and tunnel site (C4), submitters were also concerned that residents would endure years of intrusive construction impacts and would not benefit from the project and suggest that to limit impacts, the works on the Darley Road site should be restricted to a three-year program.

Response

General community amenity

Construction of a transport infrastructure project within an established urban area would inevitably generate a range of localised impacts. The benefits of the project must be balanced against these impacts, and the project must be able to demonstrate an overall net community benefit. The benefits and impacts of the project are comprehensively assessed in the EIS and associated technical papers, and management measures are proposed to minimise impacts. Construction related amenity impacts are discussed in some detail in the following sections of the EIS:

- Traffic and access impacts – Chapter 8 (Traffic and transport) and Appendix H (Technical working paper: Traffic and transport) of the EIS
- Air quality impacts – Chapter 9 (Air quality) and Appendix I (Technical working paper: Air quality) of the EIS
- Noise and vibration impacts – Chapter 10 (Noise and vibration) and Appendix J (Technical working paper: Noise and vibration) of the EIS
- Human health impacts – Chapter 11 (Human health risk) and Appendix K (Technical working paper: Human health risk assessment) of the EIS
- Visual impacts and urban design – Chapter 13 (Urban design and visual amenity) and Appendix O (Technical working paper: Landscape and visual impact) and Appendix L (Technical working paper: Urban design) of the EIS.

Changes in amenity can affect how users interact with or enjoy an environment or their ability to participate in activities or concentrate. Changes in access to public open space can also affect the operation and function of these areas. Reduced access and poor amenity may deter the community from using these spaces, which could have an indirect impact on community cohesion and interaction.

The sensitivity of an individual resident to amenity impacts would vary depending on their physical or psychological attributes, their living situation, or how they use their place of residence or neighbouring areas. For instance, some individuals are light sleepers and may have difficulty sleeping if noise impacts occur during the evening. Alternatively, a person may work or study at home, which would expose them to a longer duration of construction impacts compared to a person that is employed elsewhere.

Key changes in amenity during construction identified in section 7.2 of Appendix P (Technical working paper: Social and economic) of the EIS were influenced by noise and vibration, changes to visual amenity and changes to air quality. These issues were also regularly raised during public consultation activities undertaken during the preparation of the EIS. Family and community services properties are assessed in 7.10 of Appendix P (Technical working paper: Social and economic) of the EIS.

Construction noise and vibration

The majority of construction noise exceedances would occur in close proximity to construction ancillary facilities. The largest impacts generally occur around the Haberfield/Ashfield, Iron Cove Link, Rozelle and Darley Road construction ancillary facilities in both daytime and night-time. This would affect the way that people enjoy outdoor spaces within their property or in the local community and disturbances to sleep.

Noise impacts around Darley Road would be heavily reduced under the new site access arrangement for the site, whereby spoil haulage vehicle movements on Darley Road would be reduced (see **Chapter C8** (Traffic and transport) and **Appendix A** (Traffic and transport impact assessment) for further information on the haulage routes. Spoil haulage at the Darley Road civil and tunnel site (C4) would occur during standard construction hours only.

Construction noise may disrupt sleep for shift workers who rest during the day. Such an impact is generally not avoidable during the development of a large infrastructure project such as the M4-M5 Link. In certain cases, however, properties housing shift works may qualify for additional noise mitigation measures. In such cases the project would seek to implement these measures early in the construction process so as to provide an additional degree of mitigation during this period. Further discussion of night-time noise impacts is provided in section 7.2.1 of Appendix P (Technical working paper: Social and economic) of the EIS.

Potentially noisy work on some local streets outside the project footprint would be required for utility works. The location of these works would be confirmed during detailed design. Further detail of the proposed utility works and management of impacts associated with them is provided in Appendix F (Utilities Management Strategy) of the EIS.

Areas around Edna and Paling streets at Lilyfield are above the mainline tunnel alignment, where tunnels depths would be around 35 to 50 metres deep. Predicted settlement is within the accepted criteria at this depth (refer to section 12.3.4 of EIS).

Mitigation measures for daytime and night-time noise impacts would include the use of construction hoarding, acoustic sheds, sensitive scheduling of works, the use of low noise generating equipment, additional noise and vibration monitoring, community notification protocols and respite periods. Despite this, the SEIA recognises that these impacts would be a moderate negative impact upon local residents in the above-mentioned areas. See **Chapter E1** (Environmental management measures).

Construction dust

Construction activities such as demolition, earthworks, tunnelling, stockpiling and spoil haulage have the capacity to increase dust which has the potential to affect local amenity. This includes the impact of dust as both a nuisance (cleanliness of the environment) as well as potential health impacts (respiratory issues). The human health risk assessment prepared to inform the EIS (refer to Chapter 11 (Human health risk) determined that the potential for such impacts would be low, although it is recognised that certain events such as stormy weather may still lead to some dust soiling impacts.

Section 7.2.3 of Appendix P (Technical working paper: Social and economic) of the EIS identifies that construction activities at the Darley Road civil and tunnel site (C4) would potentially generate dust soiling and human health effects during demolition and dust soiling during construction vehicle movements.

Mitigation measures would be implemented to minimise the effects of construction dust on surrounding receivers, including minimising drop heights from machinery, using fine water sprays on dust generating equipment and for dust suppression, covering vehicle loads transport and stabilising exposed soils to prevent dust generation. Regular site inspections would also be conducted to monitor for potential dust issues.

Potential dust impacts would also be mitigated through the use of acoustic sheds around tunnelling sites, such as at Darley Road. These sheds, whilst primarily designed for acoustic shielding purposes, would also reduce air movement around stockpiles and would therefore reduce dust generation and release into nearby residential areas. In addition to this, the tracking of soil onto driveways and local roads would be monitored, with water spraying used to reduce the potential for dust generation.

These measures are described in full in **Chapter E1** (Environmental management measures) and would be outlined in the Construction Air Quality Management Plan (CAQMP). Considering this, the residual impact of dust on local receivers is considered to be low (refer to Chapter 9 (Air quality) of the EIS).

On the basis of the above, the general level of dust settlement in residential pools is not expected to substantially increase to the point that filtration systems would become overloaded or inoperable.

Ongoing construction impacts

Environmental management measures proposed to minimise the impacts associated with longer duration construction impacts from the concurrent construction of the WestConnex component projects are outlined in **section C14.2.1**.

C14.3 Social infrastructure impacts during construction

535 submitters raised concerns about the impacts on social infrastructure during construction. Refer to section 14.3 of the EIS and Appendix P (Technical working paper: Social and economic) of the EIS for details of impacts on social infrastructure during construction.

C14.3.1 Loss of open space/recreation facilities and amenity impacts to open space

Submitters expressed concern with construction impacts such as noise, diesel exhausts, congestion, dust and debris on public open space used for recreation. Concern was raised for the loss of public parkland during construction, leading to segregation from spaces. Specific areas of concern included:

- Partial loss of King George Park, including play areas and disruption to users, such as schools and sports clubs
- Impacts to active transport links around Iron Cove (the Bay Run)
- The loss of Buruwan Park would remove green space and an active transport link that provides access to Anzac Bridge and the Sydney CBD
- Loss of community open space areas
- Impacts to Blackmore Park, Easton Park, Moore Park and Sydney Park.

Response

Loss of open space

The project would require the removal of Buruwan Park at Annandale and would impact on a section of King George Park south of Victoria Road. The potential impacts associated with loss of open space at Buruwan Park and King George Park as a result of the project are assessed in section 7.3.3 and 8.3.2 of Appendix (Technical working paper: Social and economic) of the EIS.

The project has been designed to minimise the need for acquisition of public land, including areas of public open space. However, given the limited availability of vacant land in and around the project footprint and the objective of minimising acquisition of private property, some public land, including public recreation areas, would be temporarily or permanently acquired. In response to community concerns and design constraints, a number of substantial changes have been made to the project design (refer to Chapter 4 (Project development and alternatives) of the EIS) to minimise the loss of open space, including:

- Adjustment of the project footprint to avoid using Easton Park at Rozelle during construction and to minimise impact on Lilyfield Road and the heritage listed Sydney Water sewerage pumping station
- Adjustment of the project footprint to avoid using areas around Blackmore Park, Leichhardt during construction.

Buruwan Park

Permanent acquisition of Buruwan Park is required to facilitate the new alignment of The Crescent. This would be a direct loss of about 0.3 hectares of public open space at Annandale. Buruwan Park is a passive open space area that is predominantly used by pedestrians and cyclists as an active transport link through from Brenan Street and Railway Parade to Rozelle Bay and for access to the Rozelle Bay light rail stop. The park also provides a visual landscaped buffer to the elevated light rail line and the residential area of Annandale to the southwest. The park currently has poor surveillance with evidence of anti-social behaviour in the form of graffiti, with no formalised outdoor furniture and limited grassed area. The amenity of the park is compromised by its proximity to City West Link and The Crescent, which are both heavily trafficked arterial roads.

Due to the presence of more substantial parks nearby (Federal Park, Bicentennial Park and Whites Creek corridor) and the creation of the new open space at Rozelle Rail Yards, there remains, and would exist in the future, other options for the community in terms of open space if the park is removed.

Upon opening, the active transport route through this area would include a grade-separated crossing of both The Crescent and City West Link. This would provide cyclists and pedestrians arriving on Railway Parade fully segregated access to Anzac Bridge, substantially improving the safety of this route.

King George Park

The project would require the permanent acquisition of a small portion of King George Park to facilitate the construction and operation of the Iron Cove Link portals (including carriageways and footpath and cycle paths). This portion of land includes a section of the Bay Run shared path. The loss of this small portion of King George Park has been assessed in Chapter 14 (Social and economic) of the EIS as having a negligible impact on the social and economic environment. The Bay Run would be subject to a minor permanent diversion at this location, though would remain open throughout construction and operation.

Since the exhibition of the EIS, it is proposed to relocate the bioretention facility from within the informal car park within King George Park at Rozelle (adjacent to Manning Street) to the eastern abutment of Iron Cove Bridge, adjacent to Victoria Road and within King George Park. Works within King George Park would be undertaken in an area that is used as a landscaped area adjacent to the bridge which is not actively used for open space (see **Chapter D3** (Relocation of the bioretention facility at Rozelle) for further detail regarding the relocation of the bioretention facility).

Land at the eastern abutment of Iron Cove Bridge, where the bioretention facility would be located, contains primarily passive open space and landscaping areas. There are no active open space areas or playground facilities which would be impacted (other than the Bay Run, of which a small section would be diverted during the construction of the project and reinstated on completion of construction).

Upon opening, the project would provide an improved active transport link and landscaped area along the southern side of Victoria Road, which would connect to the Bay Run and King George Park.

Provision of open space

As part of the project, parts of the Rozelle Rail Yards would be developed as open space, including a constructed wetland and pedestrian and cyclist infrastructure. Open space created at the Rozelle Rail Yards would be developed and implemented in accordance with the UDLPs for the project. This new open space would provide the community at Rozelle, Annandale and other surrounding suburbs with increased opportunities for active and passive recreational activities. In the area around Wattle Street and Campbell Road, the project would include new open space areas in line with the M4 East and New M5 UDLPs. This new open space would provide a compensatory offset to the open space affected at Buruwan Park and King George Park.

No direct impacts are proposed to other parks in the vicinity, including Easton Park, Blackmore Park or Federal Park.

Reduced amenity

Construction of the project may affect the amenity of nearby open space, resulting in increased noise, dust and construction traffic, or changes in visual amenity (ie presence of construction machinery or clearing of vegetation). Changes in amenity can affect how users interact with or enjoy an environment or their ability to participate in activities and or concentrate. Changes in access to public open space can also affect the operation and function of these areas. Reduced access and poor amenity may deter the community from using these spaces, which could have an indirect impact on community cohesion and interaction.

Pedestrian and cyclist connections in these open space areas would be maintained or redirected during construction. All redirections would seek to minimise the length of the detour and to maintain the existing grade, wherever possible. Active transport links providing access to Sydney Park are being delivered as part of the New M5 project and would be provided on commencement of operation of that project. The M4-M5 Link would not impact on the implementation of these plans.

The relocation of the bioretention facility to the eastern abutment of Iron Cove Bridge would require a small additional area of King George Park. This is described further in **Chapter D3** (Relocation of the bioretention facility at Rozelle). This area contains primarily passive open space and landscaping areas and no active open space areas or playground facilities would be impacted (other than the Bay Run, which would be slightly realigned). The bioretention facility would not diminish the recreational use of King George Park.

The project has been designed to minimise construction impacts on King George Park through the considered location and placement of construction ancillary facilities and infrastructure.

Construction related amenity impacts are discussed in some detail in the following sections of the EIS:

- Traffic and access impacts - Chapter 8 (Traffic and transport) and Appendix H (Technical working paper: Traffic and transport) of the EIS
- Air quality impacts – Chapter 9 (Air quality) and Appendix I (Technical working paper: Air quality) of the EIS
- Noise and vibration impacts – Chapter 10 (Noise and vibration) and Appendix J (Technical working paper: Noise and vibration) of the EIS
- Human health impacts – Chapter 11 (Human health risk) and Appendix K (Technical working paper: Human health risk assessment) of the EIS
- Visual impacts and urban design – Chapter 13 (Urban design and visual amenity) and Appendix O (Technical working paper: Landscape and visual impact) and Appendix L (Technical working paper: Urban design) of the EIS.

Following completion of construction works it is proposed that parts of the Rozelle Rail Yards be developed as open space, including a constructed wetland and pedestrian and cyclist infrastructure. Open space created at the Rozelle Rail Yards would be developed and implemented in accordance with the UDLPs for the project. This new open space would provide the community at Rozelle, Annandale and other surrounding suburbs with increased opportunities for active and passive recreational activities. In the area around Wattle Street and Campbell Road, the project would include new open space in line with the M4 East and New M5 UDLPs.

Moore Park is located over three kilometres to the northeast of the Campbell Road civil and tunnel site. Given this distance, and that no spoil haulage routes are proposed in the areas surrounding the park, construction is unlikely to affect the park, or use of the park by recreational users.

C14.3.2 Social infrastructure amenity impacts

Submitters raised concerns about general loss of amenity and disruption for receivers using social infrastructure, particularly from traffic, noise, vibration, air quality and dust. Specific areas and/or facilities mentioned in submissions included:

- The Only About Children (OAC) Leichhardt Elswick Street Campus (preschool) and St Columba's Catholic Primary School near the William Street and Elswick Street intersection in Leichhardt
- The ability of children to learn at Rozelle Public School
- The ability of children to learn and play, and for teachers to teach, at Haberfield Public School
- The Crescent Early Learning Centre at Annandale
- General concern for elderly occupants at Smith’s Hall at Rozelle
- Childcare Explore and Develop on Norton Street at Lilyfield
- Billy Kids Learning on Charles Street at Lilyfield
- Rosebud Cottage Child Care Centre on Quirk Street at Rozelle
- Bridge Road School on Parramatta Road at Camperdown
- General concern for social infrastructure on the Balmain peninsula
- School children's access to King George Park and Drummoyne Pool
- General concern that public housing would be removed during construction
- St Thomas Child Care Centre at Rozelle
- General concern that medical and mental health services would be put under pressure from increased need of their services, and individuals' medical bills would increase.

Response

Section 5.2 of Appendix P (Technical working paper: Social and economic) of the EIS identified existing social infrastructure facilities including:

- Child care and education facilities
- Community facilities, libraries and places of worship
- Health and emergency facilities
- Sport, recreation and leisure facilities.

Section 7.10 of Appendix P (Technical working paper: Social and economic) of the EIS assess the impact of construction of the project on social infrastructure, including schools, aged care facilities, child care facilities and medical centres. The assessment identified 17 social infrastructure facilities as having a higher likelihood of experiencing multiple effects of construction amenity impacts, including seven childcare centres and four educational facilities.

Potential construction impacts to these facilities include changes to local amenity such as access and parking, as well as impacts upon individuals such as disruptions to concentration capacity or sleep. In addition to these locations, other social infrastructure facilities are also likely to be affected to a lesser degree by isolated impacts such as changes to local air quality, noise and vibration or the visual landscape (refer to Table 7.5 of Appendix P (Technical working paper: Social and economic) of the EIS).

To minimise the consequence and likelihood of impacts on social infrastructure, a Social Infrastructure Plan would be implemented to manage, minimise and avoid potential construction effects. This plan would:

- Identify social infrastructure that has the potential to be adversely affected by construction activities
- Develop, in consultation with the owners of the identified social infrastructure, measures that could be implemented to maintain appropriate vehicular and pedestrian access, management measures for noise exceedances and safety measures, particularly around areas where children are present.

The project is not expected to strain the capacity of medical and mental health services, nor affect their current ability to deliver services to the community. Refer to **section C14.5.3** for a response regarding the health related impacts as a result of construction of the project.

Camperdown

The Bridge Road School is included in Table 5-48 of Appendix P (Technical working paper: Social and economic) of the EIS as an identified education facility within close proximity to construction ancillary facilities. Potential impacts upon community facilities, including schools, were assessed in the EIS. The Bridge Road School at Camperdown would be affected during construction of the project associated with the use of the Pyrmont Bridge Road tunnel site (C9). These potential impacts include:

- Daytime noise exceedances (more than 11 dBA)
- Construction dust
- Increased construction vehicles
- Vibration effects
- Arterial road alterations.

These potential impacts would have the following effects on the school:

- Road safety for students
- Access delays, particularly at school pick-up time
- Competition for parking
- Reduced amenity during outdoor play
- Student concentration capacity and productivity.

To minimise the consequence and likelihood of impacts on social infrastructure, a Social Infrastructure Plan and Community Communication Strategy would be prepared and implemented to manage, minimise and avoid potential construction effects. See **Chapter E1** (Environmental management measures) for further information regarding measures to manage potential social and economic impacts.

Annandale

The Crescent Early Learning Centre at 7 Chapman Road, Annandale is located more than 300 metres from The Crescent civil site (C6) and was not identified as having a higher likelihood of experiencing multiple effects of construction activity. There are no spoil haulage routes proposed in this area and no noise exceedances are predicted. Potential impacts to this facility would be managed consistently with the measures identified in **Chapter E1** (Environmental management measures).

Childcare Explore and Develop at 372 Norton Street, Lilyfield was assessed in section 7.10 and Table 7-5 of Appendix P (Technical working paper: Social and economic) of the EIS. The childcare centre is located around 100 metres from the Darley Road civil and tunnel site (C4) and is predicted to experience some day-time noise exceedances (more than 11 dBA) which would reduce amenity during outdoor play and sleep times. Heavy vehicles would not use Norton Street. Potential impacts to this facility would be managed consistently with the measures identified in **Chapter E1** (Environmental management measures).

Leichhardt

The OAC Leichhardt Elswick Street Campus (preschool) and St Columba's Catholic Primary School are around 300 metres from the Darley Road civil and tunnel site (C4). Given this distance from the Darley Road civil and tunnel site, these facilities weren't identified in Table 7-5 of Appendix P (Technical working paper: Social and economic) of the EIS. Construction traffic would enter and exit the Darley Road site from the City West Link direction and would not travel on William Street or Elswick Street. No use of local roads for heavy vehicles is proposed. These facilities are not predicted to experience noise exceedances, or be affected by ground-borne noise or settlement from tunnelling.

Work on some local streets would be required for utility works to provide construction power to the Darley Road civil and tunnel site (C4) and the location of these works would be confirmed during detailed design. Further detail of the proposed utility works and management of impacts associated with them is provided in Appendix F (Utilities Management Strategy) of the EIS.

Rozelle

The Rozelle Public School was assessed in section 7.10 and Table 7-5 of Appendix P (Technical working paper: Social and economic) of the EIS. The Iron Cove Link civil site (C8) is located around 140 metres from the nearest boundary of Rozelle Public School. The project footprint however, extends along Victoria Road to Wellington Street which is closer to the school. Construction works in this location would comprise surface works which may include utility treatments, traffic management and establishment of environmental controls (such as pedestrian diversions and erosion controls). Major construction activities such as the widening of Victoria Road and construction of the ventilation facility, outlet and tunnel ramps are located further to the west along Victoria Road and away from the school.

This Iron Cove civil site (C8) would be located on the southern side of Victoria Road and would have 'left in, left out' entry restrictions. As a result, construction traffic would generally only pass in a westbound direction past the school, providing some separation between this traffic and the school (the school is adjacent to the eastbound carriageway). Construction traffic is not proposed to use Darling Street or Wellington Street onto which Rozelle Public School faces.

During construction of higher noise generating activities such as roadworks, it is predicted that the Rozelle Public School would be subject to exceedances of the noise management level (NML) by up to 20 dBA. Generally the NML exceedances arising in this area would be temporary and attributable to the intermittent use of noisy plant items such as concrete saws and rockbreakers. These items would not operate continuously through the construction period, with most operation being early in the construction program, where the removal of existing concrete or excavation of rock is required. The project would seek to minimise this impact through the use of construction hoarding and other appropriate mitigation measures which would be confirmed during detailed design. Works along Victoria Road would generally be undertaken during the evening or night to avoid significant traffic impacts on this arterial route. Evening and night works on Victoria Road would be carried out between 6.00 pm and 7.00 am and as such, noise impacts from these activities would not affect the school's daytime operations.

During the construction of the Iron Cove Link ventilation facility, noise impacts are not predicted to exceed the NML for education facilities, or any of the 'other sensitive receiver' categories. This includes the nearby Rozelle Public School.

During construction it is predicted that Rozelle Public School would exceed cumulative noise limits during pavement and infrastructure works. As such, the school would be eligible for consideration of additional noise mitigation measures such as at-property treatments. Should this be confirmed during detailed design, these measures would be considered for installation early in the construction program to provide a degree of mitigation from both construction and operational noise impacts.

Smith's Hall at 56 Burt Street, Rozelle would experience a minor impact from settlement (within the accepted criteria) and is predicted to exceed the night-time ground-borne noise criteria by 2 dBA, which means that occupants may be affected by ground-borne noise at night. Based on a progression rate of around 20 metres per week, the most affected receivers in this area are likely to experience noise levels above the night-time criterion for up to around 16 days for each roadheader. Measures to manage potential ground-borne noise are provided in full in **Chapter E1** (Environmental management measures).

Billy Kids Learning at 64 Charles Street, Lilyfield was assessed in section 7.10 and Table 7-5 of Appendix P (Technical working paper: Social and economic) of the EIS and is located around 100 metres from the Darley Road civil and tunnel site. This facility is predicted to experience some day-time noise exceedances (more than 11 dBA) which would reduce amenity during outdoor play and sleep times. Heavy vehicles would not use Charles Street. Potential impacts to this facility would be managed consistently with the measures identified in **Chapter E1** (Environmental management measures).

Rosebud Cottage Child Care Centre at 5 Quirk Street, Rozelle was assessed in section 7.10 and Table 7-5 of Appendix P (Technical working paper: Social and economic) of the EIS and is located around 100 metres from the Victoria Road civil site. This facility would be impacted by daytime noise exceedances (more than 11 dBA), changes in local road access, road safety for, access delays, particularly during the afternoon pick-up time, competition for parking and reduced amenity during outdoor play and sleep times. Heavy vehicles would not use Quirk Street. Potential impacts to this facility would be managed consistently with the measures identified in **Chapter E1** (Environmental management measures).

St Thomas Child Care Centre is located around 300 metres southwest of the Iron Cove civil site and is unlikely to be impacted by construction. This facility would already be subject to impacts from elevated traffic and associated noise and emissions from vehicle movements along Victoria Road.

Balmain

While noise impacts may extend a short distance north of the Iron Cove Link civil site (C8), the majority of the Balmain peninsula would not experience any changes to existing background noise levels. The same would apply to other amenity impacts including air quality, traffic and visual impacts. No construction traffic is proposed to use the road network in Balmain, other than along Victoria Road. Subsequently, schools, childcare facilities, medical facilities, shops and other social infrastructure on the Balmain peninsula would be largely unaffected by construction.

Haberfield

Haberfield Public School was assessed in section 7.10 and Table 7-5 of Appendix P (Technical working paper: Social and economic) of the EIS and is located around 100 metres from the Parramatta Road East civil site (C3b) and would potentially be impacted by a general increase in construction vehicles in the area. This could affect road safety for students, competition for parking and delays in access, particularly during the afternoon school pick-up time. Light vehicles may use Bland Street, however were possible, light vehicle would exit the Parramatta Road East civil site via left turn onto Parramatta Road, avoiding travelling along Bland Street past the school. Under Option B, heavy vehicles would use the Parramatta Road West civil and tunnel site, on the opposite side of Parramatta Road from the school, and not use Bland Street. No noise exceedances are predicted for the school. Potential settlement is also within the acceptable criteria.

A CTAMP would be prepared to manage potential construction traffic impacts for the project. Measures included in the CTAMP would include (but not be limited to):

- Develop construction methodologies so that interaction with existing road users is minimised thereby creating a safer work and road user environment
- Minimise the number of changes to the road users' travel paths and, where changes are required, develop and implement an effective community communication strategy, coupled with temporary wayfinding signage to warn, inform and guide. This will aim to minimise confusion by providing clear and concise traffic management schemes
- Describe a car parking strategy for construction staff at the various worksites and ancillary facilities.

During construction, measures to manage the impacts on social infrastructure, including Haberfield Public School, would be included in a Social Infrastructure Plan. These measures are outlined in **Chapter E1** (Environmental management measures).

C14.4 Business impacts during construction

510 submitters raised concerns about impacts on businesses and industry during construction. Refer to section 14.3 of the EIS and Appendix P (Technical working paper: Social and economic) of the EIS for details of impacts on businesses and industry during construction.

C14.4.1 Impacts on business during construction

Submitters raised concerns that local businesses, landlords and employees would be affected by road closures, congestion, reduced amenity and reduced patronage during construction of the project. Specific areas of concern included:

- The inner west in general
- Retail outlets, weekend markets and cafes along Rozelle High Street [Darling Street] at Rozelle
- The Canal Road Film Centre at Leichhardt
- Businesses operating in the light industrial zone between Pyrmont Bridge Road and Mallet Street
- Small businesses on King Street, Newtown
- Liverpool Road/Hume Highway (spoil routes along these roads would congest the shopping precinct)
- Tramsheds commercial area at Forest Lodge (access would be impacted by the Whites Creek bridge widening)
- Employment centres in general (construction would impede access)
- Australian Film Industry (which would be negatively impacted by traffic impacts from the Darley Road civil and tunnel site (C4))
- Pyrmont Bridge Road tunnel site (C9) would have negative impacts on the commercial viability of surrounding businesses, specifically Malt Shovel Brewery [James Squire Brewery]

- Access to business will be disrupted by trucks which may not be able to completely cross the Parramatta Road and Pyrmont Bridge Road intersection resulting in gridlock. Traffic disruptions on local and arterial roads surrounding construction sites would affect freight and commercial vehicle transport and would result in people shopping less at local businesses resulting in forced closures.

Response

Potential construction related business impacts are assessed in detail in section 7.9 of Appendix P (Technical working paper: Social and economic) of the EIS. These impacts include changes to access and visibility (passing trade) as well as amenity impacts such as increased noise and vibration, changes to the visual landscape and impacts on traffic and parking.

The business impact surveys that were undertaken indicated a broad range of responses from local businesses in relation to potential project impacts on amenity, access and trade. This is reflective of the diverse range of businesses in and around the study area, including a number of industrial and specialist commercial businesses that rely less on passing trade or local amenity. Such businesses generally indicated that construction of the project would not substantially alter their existing trade.

The physical extent of the project's construction is relatively localised and as such, impacts would generally be of a local scale. Impacts on Darling Street at Rozelle are likely to be limited to noise and vibration from construction activities at the Iron Cove Link civil site (C8) along Victoria Road. Generally the exceedances of NMLs during standard construction hours along Darling Street, Rozelle would be temporary and attributable to the intermittent use of noisy plant items such as concrete saws and rockbreakers.

These items would not operate continuously through the construction period, with most operation being early in the overall program where the removal of existing concrete or excavation of rock is required. As such impacts on the amenity of this precinct are expected to be relatively short term. It should also be noted that this precinct is likely to benefit once the project is operational and the corresponding section of Victoria Road experiences a reduction in overall traffic volumes. This is likely to permanently enhance the amenity and attractiveness of this precinct and would be expected to have flow on benefits for businesses.

Section 7.9 of Appendix P (Technical working paper: Social and economic) of the EIS outlines that businesses may be temporarily affected due to delayed or hindered access to workplaces or servicing areas owing to local traffic construction constraints and congestion. Road network performance is expected to be affected during construction with a number of temporary road closures, increased construction traffic and an expected worsening of intersection performance at some intersections. These changes may have a discernible effect on employee and customer travel time and the efficiency of servicing and deliveries (refer to section 7.1.3 of Appendix P (Technical working paper: Social and economic) of the EIS).

The CTAMP would provide measures to manage and mitigate major road network impacts. The effective implementation of these measures, including the implementation of a Community Communication Strategy aims to ensure all affected and interested parties are informed, to assist in reducing the extent of impacts on the social and economic environment. The overall impact on the social and economic environment would be a moderate negative.

In response to the specific businesses raised in the submissions:

- Access to the Canal Road Film Centre via James Street would not be impacted by the project
- Construction vehicle access arrangements at the Darley Road civil and tunnel site (C4) have been refined since the exhibition of the EIS. Alternative access arrangements to the Darley Road civil and tunnel site via westbound carriageway of City West Link and Canal Road were investigated and it was determined that this arrangement was not feasible for a range of reasons, including potential impacts to traffic using Charles Street or Canal Road. As a result, this alternative arrangement is not being pursued and heavy vehicles would not use Charles Street or Canal Road. A description of the revised access arrangements at the Darley Road civil and tunnel site is included in **section C4.17.1.**
- The Pyrmont Bridge Road tunnel site is expected to impact the surrounding environment, including the Malt Shovel Brewery, through day-time noise exceedances (more than 11 dBA), construction dust, increased construction vehicles, vibration and arterial road alterations

- King Street in Newtown (and adjoining businesses) would not be affected by construction traffic from the project.

As outlined above, the degree of impact upon individual businesses would be dependent upon the nature of the business and its specific location. The project would seek to manage these impacts through the implementation of a detailed construction car parking strategy as part of the CTAMP and as well as through the implementation of a Business Management Plan that would include:

- Identification of businesses that have the potential to be adversely affected by construction activities that would occur as part of the project
- Management measures that would be implemented to maintain appropriate vehicular and pedestrian access during business hours and visibility of the business to potential customers during construction, including alternative arrangements for times when existing access and visibility cannot be maintained. These measures would be determined in consultation with the owners of the identified businesses.

A Community Communication Strategy will also be prepared for the project including procedures and mechanisms that would be used to engage with affected business owners and tenants to identify potential access, parking, business visibility and other impacts and to develop measures to address potential impacts on a case by case basis.

Construction of the project would inject economic stimulus benefits into the local, regional and state economies. There would likely be flow-on benefits to job generation through the raw material supply chain and jobs created as a result of construction of new infrastructure. The WestConnex program of works also aims to deliver 500 apprenticeships/traineeships during the life of the project, a portion of which would be trained on the M4-M5 Link project. The WestConnex Sustainability Strategy also incorporates initiatives to improve Aboriginal and Torres Strait Islander participation in construction and provide opportunities to Aboriginal and Torres Strait Islander enterprises.

Overall, construction of the project would produce medium-long to long-term job opportunities, skill development and economic benefit to the region. There is a high likelihood of these benefits occurring with potential major consequence on the social and economic environment. As such, the overall impact of construction on the economy would be major positive.

C14.4.2 Loss of jobs due to property acquisition

The EIS is misleading because it discusses the creation of 14,350 direct jobs during construction; however it omits the fact that jobs have also been lost because of acquisition of businesses.

Response

The project has been designed to minimise the need for land acquisition, where feasible and reasonable. However, given the limited availability of land in the area identified for the project and the desire to minimise acquisition of private property, some commercial properties would be required to facilitate construction of the project, resulting in the temporary occupation or permanent acquisition of private land.

The project would result in 48 businesses being required to be removed from their existing premises and potentially choose to relocate. This includes both commercial and industrial properties that are likely to trade in a local to district catchment. Impacts of acquisition and the associated relocation of businesses can result in:

- Disruptions to business operation
- Loss of revenue
- Relocation and re-establishment costs
- Employee training expenses for new employees
- Trade catchment alterations
- Business closure.

Businesses required to close or that choose to relocate due to the project are predominantly light industrial or speciality services. These businesses would service a wider area and would likely employ a small number of workers. Due to business types and the fixed supply of alternative industrial zoned land in the surrounding area, it is likely that these businesses would relocate to another trade catchment. This would result in relocation and establishment costs with potential loss in trade and revenue during this time for individual businesses.

The relocation or closure of businesses due to property acquisition or lease cessation would also disrupt the character of business areas and affect the productivity of local economies. The impact upon the character of these areas may be partially returned should some businesses be able to re-establish in the same location post-construction. There is some potential for this to occur at the Darley Road, Pyrmont Bridge Road and Parramatta Road construction ancillary facilities, which would retain future opportunities for the land to be redeveloped, post-construction and consistent with the current land zoning.

All property acquisition undertaken by the NSW Government is in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW) and the reforms announced in October 2016 (NSW Government 2016b) (see **section 12.2.1** for further information). Consultation with affected property owners would continue during detailed design and through to construction. Future consultation arrangements are discussed in **Chapter A2** (Community and stakeholder involvement).

An exact number of potential jobs lost due to acquisitions associated with the project has not been included in the EIS given the large number of variables. It is extremely difficult to anticipate the number of businesses that may relocate, alterations in demand for business/services, viability of businesses, ability to absorb relocation costs and employment opportunities in competing businesses. Job losses are influenced by broader macroeconomic considerations (eg strength of the economy, outlook for economic growth, interest rate levels, availability of finance, unemployment levels and competition). As such, a reliable assessment of job losses due to business acquisition cannot be made with any certainty. Even allowing for some potential job losses associated with acquisition of businesses, the project would support a significant net increase in employment during the construction phase

While the EIS acknowledged the potential for adverse impacts associated with the displacement of businesses, the project would also result in a number of positive impacts for businesses including:

- Ease congestion on surface roads by providing an underground motorway alternative and allowing for increased use of surface roads by pedestrians and cyclists and for public transport
- Reduce through traffic on sections of major arterial roads including City West Link, Parramatta Road, Victoria Road, King Street, King Georges Road and Sydenham Road, facilitating urban renewal opportunities to be realised along parts of the Parramatta Road and Victoria Road corridors
- Reduce travel times on key corridors, such as between the M4 Motorway corridor and the Sydney Airport/Port Botany precinct and between the main centres on the Global Economic Corridor, including Sydney CBD, Sydney Olympic Park and Parramatta CBD

The EIS discusses the various business impacts associated with the property acquisition process in section 7.3.2 of Appendix P (Technical working paper: Social and economic) of the EIS. Due to the nature of current business activity in the areas surrounding the commercial properties to be acquired, it is not anticipated that the viability of adjacent or surrounding businesses would be affected by land acquisition. Businesses in these locations do not generally provide complementary or supplementary goods or services that would be affected by the loss of other business activity in the vicinity of their operations.

C14.5 Economic impacts during construction

28 submitters raised concerns about economic impacts during construction of the project. Refer to section 14.3 of the EIS and section 7.6 of Appendix P (Technical working paper: Social and economic) of the EIS for details of economic impacts during construction.

C14.5.1 Expenditure and employment

Submitters raised concerns regarding expenditure and employment impacts for the project. Specific concerns included:

- Construction phase would negatively impact the economy of local communities in the vicinity of construction work
- Construction will create congestion that will negatively impact access and connectivity around employment centres
- Construction traffic disruption and congestion could influence productivity, negatively impacting the inner west local economy, causing delays, lack of parking and increased travel times
- Emissions from construction traffic may impact health, which in turn create lost work and education time impacts
- Traffic congestion reduces businesses' access to human capital and goods and services, in turn reducing economic activity
- Construction will create congestion that will negatively impact access and connectivity around employment centres.

Response

Section 7.9 of Appendix P (Technical working paper: Social and economic) of the EIS acknowledges that businesses across the study area may experience impacts from construction, such as reduced efficiency of the road network, loss of parking and changes to delivery arrangements. These impacts would be an inconvenience for businesses affected, although they would be temporary in nature. The extent of impact on individual businesses would vary depending on the proximity to construction works and the duration of construction activities.

As part of the business surveys carried out to inform the SEIA, when asked about how construction may affect their overall trade and revenue, 49 per cent of respondents anticipated that there would be no obvious change in trade as a result of construction activities. Twenty per cent of respondents believed that they would experience a loss in trade, and 12 per cent believed they would experience a significant loss in trade. Potential impacts are further assessed in section 7.9 of Appendix P (Technical working paper: Social and economic) of the EIS.

Construction of the project would directly benefit the economy, injecting economic stimulus benefits into the local, regional and State economies. The economic benefit of construction is multi-dimensional, including increased expenditure at local and regional businesses through purchases by construction workers, direct employment through on-site construction activities, direct expenditure associated with on-site construction activities and indirect employment and expenditure through the provision of goods and services required for construction.

During the construction of the project, the local economy may experience a boost due to construction expenditure in the region. Based on a five-year construction period, 14,378 direct job years would be created from 2018 to 2023, which is equivalent to 2,876 jobs a year. Furthermore, around 42,351 indirect (off-site) job years would be generated, equivalent to 8,470 jobs a year based on a similar project period. Construction of the project would significantly increase the employment opportunities across the study area, and is considered to have a major positive impact on the social and economic environment.

The economic multipliers also estimate that construction would generate a further $5.8 billion of activity in production induced effects and $7.7 billion in consumption induced effects. Total economic activity generated by the construction of the project would be around $19.6 billion.

As a commitment of the WestConnex program of works, the WestConnex Training Academy was established. As outlined in the WestConnex Sustainability Strategy, the WestConnex program of work aims to deliver 500 apprenticeships and traineeships during the life of the WestConnex program of works. A portion of this number would be trained on the M4-M5 Link project. In addition to offering new opportunities for employment, the WestConnex Training Academy is providing training in tunnelling to people who have transferrable skills from other industries, like the natural resources sector. This would allow people with experience from other sectors, like mining and heavy industry, to join the workforce. The WestConnex Sustainability Strategy also incorporates initiatives to improve Aboriginal and Torres Strait Islander participation in construction and provides opportunities to Aboriginal and Torres Strait Islander enterprises.

C14.5.2 Property values

Submitters raised concern that construction activities would affect the property values of properties surrounding the construction ancillary facilities and adjacent to acquired properties. Concerns were also raised regarding:

- It would be more difficult to sell or rent property during this period, leading to loss of potential income
- The project would negatively impact investments
- Construction of the Rozelle interchange would affect property values
- The visual impact of additional power lines in Hubert Street for the Darley Road civil and tunnel site (C4) will de-value properties.

Response

Property values are driven by a range of factors. For example, business property values are generally driven by factors such as access or proximity to markets and products, customer access, and visibility while residential property values are more heavily influenced by liveability as reflected by local amenity and accessibility to employment, transport and social infrastructure.

The general presence of construction and related activities associated with the project would reduce the overall amenity of affected areas, which has the potential to impact property values during construction. However, improved traffic connectivity and provision of new open space and active transport links that would result from the project would likely be a positive influence on the property values of surrounding communities.

Future movements in the value of a property are also difficult to forecast as they are subject to many variables, including specific attributes of the property, capital improvements, demand and supply factors and other changes in the wider property market.

C14.5.3 Health-related costs

Submitters raised concerns that the construction works would lead to an increase in medical costs to families as a result of health impacts due to construction.

Response

The human health risks and costs associated with construction of the project, including those associated with air quality, noise and vibration, and social impacts were considered in sections 6 and 10 of Appendix K (Technical working paper: Human health risk assessment) of the EIS.

Changes in the urban environment associated with the project have the potential to result in a range of both positive and negative impacts on health and wellbeing of the community. Positive impacts include economic benefits, changes in traffic levels in some areas and increased public open space in areas such as the Rozelle Rail Yards. Negative impacts may occur as a result of traffic changes during construction and operation, property acquisitions, visual changes, noise impacts and changes in access/cohesion of local areas. These impacts may affect human health, resulting in disturbance of sleep, reduced capacity for concentration, interference with speech and other activities, potential effects on cardiovascular health, annoyance and increased stress levels and impacts on mental health. In many cases, these impacts are temporary and for the duration of construction only, and/or able to be managed with the management measures to mitigate health-related impacts.

The management and mitigation measures outlined in **Chapter E1** (Environmental management measures) including the CNVMP, CTAMP, CAQMP, as well as the management of the acquisition process, would be essential to reducing potential stress levels and to managing the subsequent health effects in local communities. Despite these measures, a small number of people may still experience adverse health impacts from these project-related sources.

C14.6 Operational impacts on the community

501 submitters raised concerns about changes in the community as a result of operation of the project. Refer to section 14.4 and Appendix P (Technical working paper: Social and economic) of the EIS for details of the operational impacts of the project on communities.

C14.6.1 Community values

Submitters raised concerns that the project would result in general impacts to social and community values including local character, liveability and quality of life.

Specific concerns mentioned in submissions include:

- The project would result in negative socio-economic impacts to communities including the inner west
- The project creates intergenerational inequality in the community
- Families may move away from the affected areas
- The project would create gentrification in Alexandria, pushing out long term residents
- Annandale residents would experience significant detrimental impacts to quality of life through impacts on the use of public space by other members of the community
- The project would lead to social inequality
- The character of suburbs such as Alexandria, Newtown, Stanmore, Enmore and Erskineville would be negatively impacted
- The project will impact the local sense of place of Rozelle
- Residents' quality of life would be affected by traffic from the Iron Cove Link, and the Rozelle and St Peters interchanges
- Residents in proximity to Johnston Street would experience a diminished quality of life due to increased traffic
- Street life in St Peters and Newtown would be impacted due to increased traffic as traffic will be diverted towards Euston Road and King Street
- Ventilation outlets would have a negative social and public health effect on the surrounding areas
- The project will lead to crime
- Increased traffic on local roads will affect the quality of life for children.

Submitters have also voiced general support for the project, stating the positive impact the project will have on safety, the social and cultural environment, amenity and economic benefits.

Response

What the project would deliver

General support for the project is noted.

Due to its size and complexity, the project would have an impact on local culture, character, liveability, quality of life and lifestyle in surrounding communities.

The environmental issues associated with these impacts are assessed within the relevant chapters of the EIS, including Chapter 8 (Traffic and transport), Chapter 9 (Air quality), Chapter 10 (Noise and vibration), Chapter 12 (Land use and property) and Chapter 13 (Urban design and visual amenity). The social impacts of the project are considered more broadly in Chapter 14 (Social and economic) and Appendix P (Technical working paper: Social and economic) of the EIS.

Overall, the SEIA identified that the project would result in a range of positive and negative social and economic impacts on residents, businesses and social infrastructure. The impacts would vary in their distribution across the study area.

Upon operation, the project is likely to result in an overall major positive impact within the study area and broader region. This would result from an enhanced network capacity and connectivity between the Sydney CBD, inner west, south, south-western and western Sydney. The positive impact of the operation of the project would benefit future generations. Providing an underground motorway alternative would reduce congestion on the surface road network, allowing for increased use of surface roads by pedestrians and cyclists and for public transport. This would also improve the safety conditions along the majority of local roads surrounding the project.

Impacts to amenity during operation are described in section 14.4.3 of Appendix P (Technical working paper: Social and economic) of the EIS, including those related to noise and vibration, air quality and visual amenity for suburbs in the inner west. The project would improve general amenity within the study area by reducing the volume of traffic on some surface roads, which would be displaced into the mainline tunnels. This would subsequently reduce current levels of noise and vibration, air pollution from vehicle emissions, traffic movements and congestion. In addition, the project provides opportunities for:

- Creation of open space at Rozelle Rail Yards and Iron Cove for community and recreational use
- New and improved active transport links at Rozelle, connecting currently disconnected communities and improving community cohesion
- Potential future urban revitalisation and public transport improvements along existing arterial roads, particularly along Victoria Road at Rozelle and Parramatta Road east of Haberfield as a result of reductions in surface traffic volumes.

Given the operation of the project is likely to result in an overall major positive impact within the study area and broader region it is considered unlikely that the project would cause families within the study area to relocate to a different area.

Gentrification (the process of improving deteriorated neighbourhoods) is a broader phenomenon which is influenced by a number of different variables. As a result it is considered to be beyond the scope of the project.

The delivery of open space and active transport links at the Rozelle Rail Yards is considered to provide a range of socio-economic benefits (refer to section 8.3.2 of Appendix P (Technical working paper: Social and economic) of the EIS). Open space in areas may also present some hazards, such as attracting antisocial behaviours (particularly in isolated areas). However, these may be mitigated through Crime Prevention Through Environmental Design (CPTED) principles (refer below for further information).

The project is not anticipated to disproportionately impact a particular demographic of the community within the study area. Concerns raised regarding tolling and related potential impacts to social inequality are discussed in **section C14.9.2**.

Concerns related to the loss of character within suburbs, including around Alexandria are addressed in **section C14.6.3** for impacts related to amenity and **section C13.3** for impacts related to urban design and landscape character. See **Chapter C20** (Non-Aboriginal heritage) for refer a description of heritage impacts in respect to loss of character.

Impacts associated with traffic from the project

Appendix H (Technical working paper: Traffic and transport) of the EIS forecasts that the project would improve network productivity across the Greater Sydney network. This means that more trips are expected to be made or longer distances travelled in the network, in a shorter time. This would also support the long-term economic growth of Sydney through improved motorway access and connections, linking Sydney's international gateways to key places of business. This would result in direct and indirect socio-economic benefits for a large number of residents, businesses and social infrastructure facilities and users across the Greater Sydney region. Reduced vehicle traffic volumes on the surface road network tend to:

- Make walking and cycling safer, more comfortable and more convenient. Improved walking and cycling conditions are particularly important for people with disabilities, the elderly, and children, who are more dependent on non-motorised travel, and often have difficulty crossing busy roads

- Improve safety and reduce the severity of vehicle crashes, particularly those involving pedestrians and cyclists
- Increase the attractiveness and amenity of an environment
- Reduce business visibility to passing traffic, which may impact business revenue
- Improve connectivity which increases neighbourhood interaction and improves social cohesion.

There are significant reductions in forecast daily traffic volumes along Victoria Road (south of the proposed Iron Cove Link), King Georges Road, Stanmore Road, Addison Road, Sydenham Road, City West Link, Parramatta Road, King Street and Lyons Road, compared to the 'Without project' scenario. A decrease in the daily volume of heavy vehicles on surface roads is also forecast, as heavy vehicles shift onto the M4-M5 Link. Daily heavy vehicle volumes on Parramatta Road and City West Link are forecast to drop by around 40 to 50 per cent, and roads in the inner west, such as Stanmore Road, Sydenham Road, Marrickville Road and King Street, are forecast to drop by 20 to 50 per cent. Further information is provided in the heavy vehicle screenline analysis in Annexure D of Appendix H (Technical working paper: Traffic and transport) of the EIS. These changes would improve the safety, amenity and liveability of these roads and their surrounding areas.

While the overall network is expected to improve, the project may negatively affect the amenity and accessibility of a number of residential properties, businesses and social infrastructure facilities in locations where traffic volumes are predicted to increase, such as within Annandale (Johnston and Catherine streets), Camperdown (Ross Street), north of Iron Cove Bridge (Victoria Road/Gladesville Bridge) and Anzac Bridge.

The movement of traffic between the surface road network and new road links at the Rozelle interchange is forecast to result in an increase in traffic on some roads including Johnston Street when comparing the 'With project' and 'Cumulative' scenarios to the 'Without project' scenario. Two-way average weekday traffic (AWT) along Johnston Street is forecast to increase by 14 per cent in 2023 and by eight per cent in 2033 in the 'With project' scenario, and 15 percent in 2023 and 12 per cent in 2033 in the 'Cumulative scenario (refer to section 9.4.1 of Appendix H (Technical working paper: Traffic and transport) of the EIS).

There would be commensurate increases in traffic noise associated with this forecast increase in two-way AWT volumes.

Johnston Street is a State road, which provides an important link between Parramatta Road and The Crescent. There is an area of alfresco dining near the intersection with Booth Street, though the street is largely residential. No street markets are known to take place on or near Johnston Street and only one playground, Hinsby Park, is located along the street. Annandale Public School, Annandale North Public School, TAFE NSW Petersham College, a church and an aged-care facility are located along Johnston Street.

Despite overall network improvements, St Peters interchange and surrounds are forecast to experience increased congestion and delays during the PM peak in 2023 and 2033. The forecast in traffic growth for the St Peters interchange and surrounds is expected to cause delays and increase congestion for users. Negative socio-economic impacts associated with delays and congestion includes increased travel time, health impacts and community severance, and reduced safety, and amenity. Active transport will be provided around the St Peters interchange in accordance with the New M5 project conditions of approval and New M5 UDLPs. Pedestrian connectivity in the area surrounding the St Peters interchange would improve once the New M5 project is completed, providing connections along Campbell Road, across Campbell Road to Sydney Park and through the St Peters interchange.

Euston Road would be subject to minor increases in traffic (about 100 vehicles (two-way) in each of the AM and PM peak) which may affect competition for parking for people using Sydney Park or adjacent businesses. This minor increase is small compared to the more significant increases in traffic associated with the New M5 project.

Key observations comparing the 2023 'Without project' and 'With project' scenarios also show significant forecast reductions on King Street, where two-way AWT traffic decreases by just under 4,000 vehicles daily (a drop of 19 per cent). A similar reduction is forecast under the 2023 'With project' scenario. This forecast reduction in AWT traffic volumes would improve the amenity of King Street and is not expected to detrimentally affect the business amenity and street life along King Street.

As with the M4 East and New M5 projects, Roads and Maritime would undertake a Road Network Performance Review, in consultation with Transport for NSW and relevant councils. This would confirm the operational traffic impacts of the M4-M5 Link on surrounding arterial roads and major intersections at both 12 months and five years after opening of the project. The assessment would be based on future updated traffic surveys taken during operation utilising an appropriate methodology following the relevant and industry accepted guidelines current at the time. Regardless, those areas that have been identified as being potentially impacted by the project have been identified in Appendix H (Technical working paper: Traffic and transport) of the EIS and would be addressed prior to these operational reviews, or as needed.

The network performance review would focus on the areas forecast as being potentially impacted by the project including roads in the vicinity of each of the three interchanges. In regards to the Balmain peninsula the review would include key connecting roads such as Victoria Road, The Crescent (including around Johnston Street), City West Link and the resulting impacts on Anzac Bridge. Following the review of network operations specific measures will be investigated and identified to manage the road network performance to mitigate impacts to performance. The implementation of these measures would be subject to separate environmental assessment and approval and are outside the scope of the project. See **Chapter E1** (Environmental management measures) for further information.

Impacts associated with operational infrastructure

The project includes the operation of four ventilation facilities at Haberfield, in Rozelle near the eastern abutment of Iron Cove Bridge, the Rozelle Rail Yards and St Peters interchange. The changes to local air quality and visual amenity were assessed in Chapter 9 (Air quality) and Chapter 13 (Urban design and visual amenity) of the EIS respectively. The human health risk assessment summarised in Chapter 11 (Human health risk) of the EIS concluded that no acute or chronic health risks to local communities would arise due to the project. Conversely, the project would be expected to result in a decrease in total pollutant levels within the study area due to the redistribution of vehicle emissions as a result of traffic moving from surface roads into the motorway tunnels. For much of the community this would result in no change or a small improvement to the existing amenity in these areas.

Under forecast traffic conditions with the project, the contribution of tunnel ventilation outlets to air pollutant concentrations was negligible. Predicted changes in pollutant concentration were driven by changes in traffic volumes on the modelled surface road network, not by the tunnel ventilation outlets.

In terms of visual impact, the project would result in potential changes to some important views for some receptors, generally as a result of the presence of permanent operational infrastructure at Darley Road, Rozelle, Iron Cove and St Peters, particularly, ventilation facilities and outlets. The operation of the project would result in potential alterations to and partial loss of views to the city skyline from Rozelle Bay and/or Glebe Point. These alterations to views may have direct impacts on the amenity of the location and quality of life. However, new open space and active transport links at Rozelle would improve views from nearby properties that overlook this area and also create new views for users of this open space and active transport links.

The existing visual character comprises established urban development with major road corridors and supporting infrastructure. Changes to views may have direct impacts on the amenity of the location and quality of life generally. Properties in Lilyfield who presently overlook the industrial buildings and infrastructure at the Rozelle Rail Yards would experience improved views of new open space and active transport links at Rozelle.

The assessment of operational noise generated by fixed facilities, such as ventilation facilities and water treatment plants, identified a noise exceedance in only one noise catchment area (NCA) at Iron Cove (NCA33). Noise impacts at this location are expected to be reduced through the selection of low noise equipment and other mitigation applied at the detailed design stage. Visual and air quality impacts associated with non-ventilation fixed facilities are expected to be negligible.

Principles of CPTED would be considered and incorporated into the urban design through the preparation of the UDLPs for the project to reduce opportunities for crime around operational infrastructure. See section 13.5.8 of Chapter 13 (Urban design and visual amenity) of the EIS for further information regarding the incorporation of principles of CPTED into the UDLPs for the project.

C14.6.2 Access, connectivity and community cohesion

Submitters raised concerns that operation of the project would affect the community through changes to access, would result in severance of communities and affect community connectivity and cohesion. Specific concerns included:

- The walkability of Rozelle village and the suburb of St Peters would be affected
- Social isolation of people who do not drive will become more severe in car-dependent suburbs
- Without an overpass or underpass, separation between the communities of Rozelle and Balmain will be exacerbated
- Pedestrian amenity around the Victoria Road/The Crescent/City West Link intersection would be affected with the removal of two footbridges, which currently provide safe and convenient access to public bus transport
- Increased traffic around St Peters interchange would impact pedestrian and car movements to and around parks, shops, bus stops and train stations
- The project will divide and isolate neighbourhoods by affecting the local road and active transport network
- Large development projects like WestConnex are anti-urban and destructive to inner-city spaces, permanently disrupting communities
- Families would be displaced, leading to the break-up of communities
- Lilyfield and Leichhardt would be bisected by the project, isolating pockets of the community
- The Rozelle village community would be geographically divided, giving traffic higher priority than residents
- Plans for family members to move closer to their family residing in areas affected by the project in Haberfield would no longer be viable
- Community links between Haberfield and Ashfield and Haberfield and Five Dock would be impaired by the project
- Suggestion of an active transport link for pedestrians and cyclists at Terry Street across Victoria Road that would connect the communities of Rozelle and Balmain.

Response

The project has been designed to minimise potential community isolation, segmentation and/or severance. This is primarily achieved through the adoption of a tunnel concept for the new motorway, which runs underground for most of its length (refer to Chapter 4 (Project development and alternatives) of the EIS). As a result, the project design significantly reduces the requirement for surface land acquisition and consequential impacts on local connectivity when compared to a surface motorway concept.

The project would generally improve intersection performance, reduce travel times and increase average speeds across the Sydney metropolitan road network. The traffic modelling indicates that by 2033, there would be an overall increase of 498,000 kilometres travelled and a reduction of 46,000 vehicle hours travelled (VHT) on the network. This increase is largely due to the redirection of vehicles (in particular heavy vehicles) from existing surface roads to the new, faster M4-M5 Link. By reducing congestion, the project would enhance both local and regional connectivity and encourage greater participation in active transport across several suburbs of the inner west. These improvements would also help to connect residential communities around the project, potentially improving community cohesion generally in the inner west.

Around Lilyfield and Leichhardt, existing infrastructure, including the Rozelle Rail Yards, City West Link and the light rail line currently operate as physical and psychological barriers between communities. Two pedestrian and cyclist bridges over City West Link leading into the new public open space at the Rozelle Rail Yards would provide substantially improved north-south connections between Annandale, Rozelle, Lilyfield and beyond, including connections between the Glebe Foreshore parklands and Easton Park, as well as connecting to Rozelle Bay light rail stop. This would directly benefit the communities of Annandale, Glebe, Lilyfield and Rozelle.

As described in Table 6-20 of the EIS, the removal of two active transport bridges at Rozelle (east-west over Victoria Road and north-south over The Crescent (City West Link)) would occur during construction. In recognition of the importance of these connections for active transport users, these active transport bridges would not be removed until equivalent connections are established. The proposed equivalent connections are described in section 7.4.7 of Appendix H (Technical working paper: Traffic and transport) of the EIS.

The project would provide pedestrian and cyclist bridges that would increase the opportunities for communities to connect and interact, contributing to community and social cohesion. A new pedestrian footpath and separated cycleway would be provided between Springside Street and the Bay Run at Byrnes Street on the western side of Victoria Road, improving the quality of local active transport links.

The Rozelle village community is currently divided by Victoria Road. During operation, traffic volumes on Victoria Road are predicted to significantly reduce, and the existing pedestrian connectivity across Victoria Road would be retained.

The existing at-grade pedestrian connections across Victoria Road at Rozelle (at Terry Street and Wellington Street) would be retained. The pedestrian connection under Victoria Road beneath Iron Cove Bridge would also be retained. Whilst it is not proposed to convert these into grade separated active transport connections, it is expected that the vast majority of traffic in this area would use the toll-free Iron Cove Link, significantly reducing both the amount of surface traffic and the subsequent physical and psychological barrier effects of Victoria Road east of the tunnel portals.

While Victoria Road would be widened around the Iron Cove link portals at Rozelle, the reduction in operational surface traffic would allow for potential improvements in community connectivity north-south across Victoria Road. The predicted reduction in traffic along this section of Victoria Road may allow pedestrian and cyclist signals to be given greater priority (eg greater crossing frequency and duration). This is demonstrated by the forecast intersection LoS at the Victoria Road/Darling Street and Victoria Road /Wellington Street intersections, which are generally forecast to improve (refer to section 10.4.3 of Appendix H (Technical working paper: Traffic and transport) of the EIS.

At Haberfield, the physical changes that may affect community cohesion include the widening of Parramatta Road and Wattle Street; however these would occur as part of the M4 East project. No further changes to these roads are proposed by the M4-M5 Link project. The project would not change pedestrian crossings (either existing or being constructed as part of the M4 East project) and no permanent operational infrastructure would be constructed as part of the project at Haberfield that would impact on community cohesion.

Impacts on community cohesion at Haberfield and Ashfield during operation of the M4 East project are described in Chapter 14 of the M4 East EIS.

Campbell Road at St Peters is currently used as a local route by cyclists due to low traffic volumes. The New M5 project would upgrade Campbell Road, with a forecast increase in traffic volumes. Delivery of the New M5 project would also include construction of a separated cycle path along Campbell Road (forming part of the Bourke Street Link), connecting Newtown to the Bourke Street Cycleway, Green Square and the Sydney CBD.

The project delivers on the NSW Government's plans to deliver an integrated transport solution, comprising roads and public transport, to address congestion on Sydney's roads. This is discussed further in Chapter 3 (Strategic context and project need) of the EIS. The project, as part of the WestConnex program of works, would act as a catalyst for urban renewal along parts of Parramatta Road and Victoria Road which may facilitate future public transport improvements along these key transport corridors.

C14.6.3 Reduced amenity for residents

Submitters raised concern about impacts to the amenity of residential and tourist areas as a result of the project, including from increased noise, air pollution (including from placement and no filtering of ventilation outlets), traffic and congestion. Specific areas of concern include:

- The inner west generally
- St Peters, including around the St Peters interchange
- Commuters in the Alexandria area
- Around the Rozelle interchange and Callan Street at Rozelle

- Around the Iron Cove Link
- Bridge Road at Forest Lodge
- Wattle Street at Haberfield
- The Western Distributor
- Streets in Alexandria, including Euston Road, McEvoy, Botany, Bourke, Lachlan and Wyndham streets
- Around the Darley Road motorway operations complex, substation and water treatment plant at Leichhardt
- Streets in Glebe, including The Crescent, Minogue Crescent, Ross, Mount Vernon, Catherine, Ross and Arundel streets
- Concerns were also raised indicating that reduced amenity may stop people from going outside.

Submitters noted that the M4-M5 Link and other WestConnex projects would improve public amenity at the surface.

Response

The comments received from the community stating that the M4-M5 Link and other WestConnex projects would improve public amenity at the surface is noted.

Potential impacts to residential amenity during the operation of the project may occur as a result of:

- Changes in visual amenity due to permanent operational facilities
- Changes to traffic and public and active transport
- Changes to noise levels relating to traffic and operational facilities
- Changes in the quality and amount of public open space
- Changes to air quality.

The environmental issues associated with quality of life and amenity are identified and assessed within the relevant chapters of the EIS, including Chapter 8 (Traffic and transport), Chapter 9 (Air quality), Chapter 10 (Noise and vibration), Chapter 12 (Land use and property) and Chapter 13 (Urban design and visual amenity).

During operation, traffic related noise in the study area is generally expected to decrease as a result of traffic being displaced from surface roads into the tunnels. This would have a moderate positive impact, resulting in a noticeable and substantial positive change in the existing environment. This impact would be long-term and would affect a large number of people.

Reductions in noise are identified along sections of Victoria Road at Rozelle where the project is forecast to reduce traffic numbers. This would be a positive effect, likely to include increased amenity and ambience for residents living near these locations.

Increases in noise are identified in areas such as along parts of Johnston Street where traffic volumes are expected to increase, and in Iron Cove to the south of Victoria Road (Byrnes, Clubb, Toelle, Callan and Springside streets) where noise shielding from the front row of buildings would be removed due to property acquisitions and subsequent demolition. Residents at these locations would be more susceptible to health impacts associated with increased noise, such as general annoyance (eg having to keep windows closed), sleep disturbance and interference with household activities (eg eating outdoors).

Mitigation measures, such as noise barriers or architectural treatments, would be provided as part of the project, which would reduce noise impacts. Appendix J (Technical working paper: Noise and vibration) of the EIS has identified potential noise barrier locations, located to the south of Iron Cove and on the western side of Victoria Road, near Lilyfield and Rozelle, which may reduce noise for triggered receivers. These noise barriers would be subject to detailed design and engagement with the community. In addition, at-receiver acoustic treatment would be considered for eligible properties where noise exceedances were still predicted.

The project is expected to result in an overall reduction in total air pollutant levels in the community and a redistribution of emissions to the tunnels as there would be less vehicles using surface roads. For much of the community this would result in no change or a small improvement to existing conditions, resulting in a negligible impact. Changes in air quality related health incidents are expected to be negligible.

The built form components of the project would result in alterations to existing views for a number of residential properties. Some of these views would be altered due to the addition of project elements such as ventilation facilities and outlets, water treatment plants, electricity substations, air intake facilities and tunnel portals.

The operation of the project would result in changed views for receivers at Darley Road, Rozelle, Iron Cove and St Peters, generally from the operation of permanent operational infrastructure such as ventilation facilities and outlets. These changes may have direct impacts on the amenity of the location and quality of life. However, new open space and active transport links would improve views for numerous receivers in particular at Rozelle, improving the surrounding amenity. The potential visual impacts during operation of the project are assessed in section 13.5 of Chapter 13 (Urban design and visual amenity) of the EIS.

Design options have been considered to minimise the visual impacts of prominent infrastructure to surrounding residential areas. This would include:

- Street tree planting for screening, shade and canopy
- High quality finishes to buildings and ventilation facilities to facilitate long term durability and minimal maintenance and create a positive urban design outcome.

During detailed design, measures to reduce the height, bulk, scale and enhance the landscape setting of the ventilation outlets will be investigated, subject to achieving desired ventilation outcomes, and in accordance with the design principles detailed in Appendix L (Technical working paper: Urban design) of the EIS. In addition, the following management measures are proposed (see **Chapter E1** (Environmental management measures)):

- Environmental management measure LV16 - develop a design that aims to incorporate the ventilation outlets at the Rozelle Rail Yards as an integral component of the larger open space composition, with reference and consideration to the Ventilation Facility Design Review (Annexure 2 of Appendix L (Technical working paper: Urban design))
- Environmental management measure LV19 - investigate vegetative and other screening measures along Victoria Road to improve the visual amenity of the streetscape and reduce impacts associated with the ventilation outlet and increased glare from the portals to residential dwellings to the north of Victoria Road. Reasonable and feasible landscaping measures will be included in the relevant UDLP
- Environmental management measure LV22 - investigate measures during detailed design to reduce the height, bulk, scale and enhance the landscape setting of the ventilation outlets, subject to achieving desired ventilation outcomes, and in accordance with the design principles detailed in Appendix L (Technical working paper: Urban design) of the EIS.

Following an assessment of traffic, environmental and community impacts, the Camperdown interchange was removed from the project. The Camperdown interchange was intended to provide entry and exit ramps connecting to Parramatta Road for drivers travelling to and from the Sydney CBD. The benefits of removing the Camperdown interchange from the project are outlined in Chapter 4 (Project development and alternatives) of the EIS. As a result of the removal of the Camperdown interchange, amenity impacts from changes in traffic throughout Glebe, including along The Crescent, Minogue Crescent, Mount Vernon, Catherine, Ross and Arundel streets would be minimised.

C14.7 Operational impacts on social infrastructure

316 submitters raised concerns about the impacts on social infrastructure during operation. Refer to section 14.4 and Appendix P (Technical working paper: Social and economic) of the EIS for details of impacts on social infrastructure during operation.

C14.7.1 Impacts to public open space

Submitters expressed concern that the project would impact the usability of open space. Specific areas of concern include:

- The Iron Cove Link ventilation facility will impact the use of King George Park, including the children's playground and the Bay Run
- Impacts to Sydney Park, including that access may be compromised
- Loss of green space after construction
- Impacts to Easton Park.

Response

Appendix I (Technical working paper: Air quality) of the EIS indicates that potential air quality impacts to King George Park from the Iron Cove Link ventilation outlet, including the Bay Run, would be limited. Emissions from the ventilation facility in this location are not expected to result in acute or chronic health effects to local communities or recreational users. Air quality in this area is expected to improve, due to the redistribution of vehicle emissions, specifically in relation to emissions derived from vehicles currently using surface roads that would be directed into the Iron Cove Link. Operational noise from the operation of the ventilation facility would be reduced through the selection of low noise equipment and other mitigation applied at the detailed design stage.

Visual and air quality impacts associated with the ventilation facility are expected to be negligible. The overall impact to the amenity of King George Park, including the children's playgrounds and the Bay Run in the vicinity of the Iron Cove Link ventilation facility is expected to be minimal.

As outlined in **Chapter D3** (Relocation of the bioretention facility at Rozelle), it is proposed to relocate the bioretention facility at Rozelle around 150 metres north of the location presented in the EIS, to an area adjacent to Victoria Road at the eastern abutment of Iron Cove Bridge and within King George Park (see **Figure D3-1**). Further information is provided in **Chapter D3** (Relocation of the bioretention facility at Rozelle). Works within King George Park would be undertaken in an area that is used as a landscaped area adjacent to the Iron Cove Bridge which is not actively used for open space.

Upon opening, the project would provide an improved active transport link and landscaped area along the southern side of Victoria Road, which would connect to the Bay Run and King George Park.

As part of the project, parts of the Rozelle Rail Yards would be developed as open space, including a constructed wetland and pedestrian and cyclist infrastructure. Open space created at the Rozelle Rail Yards would be developed and implemented in accordance with the UDLPs for the project. This new open space would provide the community at Rozelle, Annandale and other surrounding suburbs with increased opportunities for active and passive recreational activities. In the area around Wattle Street and Campbell Road, the project would include new open space areas in line with the M4 East and New M5 UDLPs. This new open space would provide a compensatory offset to the open space affected at Buruwan Park and King George Park.

Active transport links providing access to Sydney Park are being delivered as part of the New M5 project and would be provided on operation of that project. The M4-M5 Link would not impact on the implementation of these plans.

The permanent loss of open space, including at Buruwan Park and King George Park, and the loss of green space is discussed in **section C14.3.1**.

The project footprint was adjusted to avoid using Easton Park at Rozelle during construction and the park would not be directly impacted during operation of the project. Connection to Easton Park will be improved by the new open space area at Rozelle and the north-south active transport link to be delivered by the project.

C14.7.2 Impacts to social infrastructure

Submitters raised concerns that the operation of the project would impact on and strain community facilities, including local schools and in particular the following:

- Concern regarding the impact of the project on schools in proximity to the project area, including the Rozelle Public School
- Concern that the project would cause strain and financial problems on the public hospital systems and individuals' medical bills as a result of increased health impacts due to air pollution
- Impacts to Smith's Hall at Rozelle should be avoided
- Stormwater discharged to Hawthorne Canal and Iron Cove from the Darley Road water treatment plant would affect recreational activities in those waterways
- Permanent impacts to social infrastructure facilities, including impacts to active transport links around Iron Cove that provide access to recreational areas of King George Park and Drummoyne Pool.

Response

Appendix P (Technical working paper: Social and economic) of the EIS provides an assessment of impacts on community facilities resulting from the project. The focus of the assessment was mainly on directly affected properties, but also considered those in the vicinity of the project if potential indirect impacts were anticipated. A comprehensive list of community facilities within the study area, including Rozelle Public School, is provided in section 5.2 of Appendix P (Technical working paper: Social and economic) of the EIS.

Rozelle Public School is located within close proximity of Victoria Road, which is a heavily trafficked arterial road subject to existing traffic noise and air pollution from vehicle emissions. With the project, traffic noise is predicted to decrease and air quality is predicted to improve at Rozelle Public School with surface road traffic being removed from Victoria Road and diverted onto the Iron Cove Link.

The human health risk assessment undertaken for the project assessed the overall impact to community health arising from the project, with specific reference to air quality impacts. Potential health impacts associated with changes in air quality (specifically nitrogen dioxide and particulates) within the local community have been assessed and are considered to be acceptable in relation to the applicable standards. As such the project is unlikely to affect community health to such a degree that any local health facilities are placed under strain. See **section C14.9.4** for a response regarding the health-related costs as a result of the project.

Further information regarding the concern raised regarding stormwater discharge into receiving waterways is provided in the response in **section C15.3** and **C15.6**.

The intersection performance at Victoria Road/Darling Street and Victoria Road/Wellington Street generally improves with the project.

Smith's Hall at 56 Burt Street, Rozelle is around 300 metres from the Rozelle ventilation outlets and the facility would benefit from the improved active transport links and access to open space proposed at Rozelle, and associated improved views.

C14.8 Operational impacts on businesses and industry

94 submitters raised concerns about impacts on businesses and industry during operation. Refer to section 14.4 and Appendix P (Technical working paper: Social and economic) of the EIS for details of impacts on businesses and industry during operation.

C14.8.1 Impacts on businesses

Submitters raised general concerns that the project would affect businesses in suburbs of the inner west, including St Peters and Newtown, for a number of reasons, including:

- Reduced parking availability, increased traffic and the introduction of clearways on High Street at Newtown will affect business operations
- Increase traffic on Euston Road and King Street, and through St Peters generally, would disrupt businesses

- Businesses along Victoria Road at Gladesville will be negatively impacted by increased congestion
- Reduced amenity for businesses, including changes to noise and air quality
- Reduced access to local businesses through undesirable pedestrian access routes
- Positive impacts on existing business are reliant on the construction of other major transport projects including the proposed future Western Harbour Tunnel, Sydney Gateway and F6 Extension.

Response

Impacts from operation of the project on surrounding businesses including impacts on business amenity (noise and air quality) and accessibility (traffic and parking) have been assessed in chapter 8 of Appendix P (Technical working paper: Social and economic) of the EIS. The EIS demonstrated that these impacts could be managed within acceptable limits with the implementation of environmental management measures (see **Chapter E1** (Environmental management measures)).

Overall, the road, active transport and public transport networks would improve during operation of the project. Increased accessibility and connectivity has the potential to reduce delivery time, increase delivery reliability and reduce transport costs to local businesses. A reduction in traffic is expected along Victoria Road, east of Iron Cove Bridge, which would potentially benefit businesses along Victoria Road and Darling Street through general improved amenity and improved access. The reduction in traffic may activate the commercial areas by improving the amenity along this heavily trafficked and degraded road corridor, however this may also reduce passing vehicular trade for those businesses that rely on it. There are no permanent impacts on on-street parking near business and commercial areas as part of the project.

No clearways are proposed on King Street or High Street at Newtown, or on any other roads as part of the project. Traffic along King Street is predicted to reduce as a result of the project, which would improve the amenity for street fronting businesses. Only a small increase in traffic is predicted on Euston Road as a result of the project. Euston Road is being upgraded as part of New M5 project.

There is predicted to be an increase in traffic on Victoria Road through Drummoyne and Gladesville, which may have some limited impact on access to businesses in these areas. No changes to on-street parking restrictions along these roads are proposed as part of the project.

There are a number of other major roads, including Parramatta Road, Lyons Road and Addison Road, where traffic volumes are predicted to reduce as a result of the project. Businesses along these roads would benefit from the improved amenity and access as a result.

Once operational the project is predicted to result in a reduction in noise levels for around 60 per cent of the receivers within the study area. The reduced noise levels would likely improve the ambience of the outdoor and indoor environment, therefore potentially increasing the number of visitors and passing trade for businesses. Less than one per cent of receivers in the study area are predicted to experience traffic noise increases of more than 2 dBA.

The project provides an opportunity to address poor active transport connectivity in the study area, including along Victoria Road and the Rozelle Rail Yards at Rozelle. In addition, the diverting of through traffic from local roads onto roads upgraded as part of the project around the interchanges and into the WestConnex tunnels would improve pedestrian and cyclist safety. This would provide increased access to local businesses for pedestrians and cyclists. Refer to Chapter 13 (Urban design and visual amenity) of the EIS for further information regarding active transport connectivity for the operation of the project.

The NSW Government has committed to the delivery of the proposed future Western Harbour Tunnel, Sydney Gateway and F6 Extension which are subject to separate environmental assessment and approval. The traffic assessment included assumptions about the timing of the construction and operation of the proposed future Western Harbour Tunnel, Sydney Gateway and F6 Extension projects for the operational ‘Cumulative 2023’ and ‘Cumulative 2033’ scenarios. In the event of unforeseen delays to these projects this may impact on the traffic forecasts for the cumulative scenarios in the EIS. These projects are in the design development stage and would be subject to their own approval process. Potential associated cumulative impacts would be assessed in the respective project EISs.

C14.8.2 Impacts on industry

Submitters raised general concerns regarding the potential impacts of the project on industry, including:

- Increased traffic would negatively impact productivity due to impeded public and active transport networks. This in turn reduces access to employment centres
- The project would cause long-term economic impacts on industry, due to the decentralisation of commercial investments.

Response

Potential impacts to industry and employment connectivity are described in section 14.4 of Chapter 14 (Social and economic) of the EIS. By providing a motorway link between the M4 East at Haberfield and the New M5 at St Peters, the project would help to connect major employment centres, which are critical in supporting the creation of jobs and businesses. This would include centres within the 'global economic corridor', which includes the Sydney Airport and Port Botany precinct, Parramatta CBD, Sydney CBD as well as Sydney Olympic Park. The project would also support the Western Sydney Employment Area, which is outside the global economic corridor.

The benefits provided by the project as part of the WestConnex program of works include:

- Ease congestion on surface roads by providing an underground motorway alternative and allowing for increased use of surface roads by pedestrians and cyclists and for public transport
- Reduce through traffic on sections of major arterial roads including City West Link, Parramatta Road, Victoria Road, King Street, King Georges Road and Sydenham Road, facilitating urban renewal opportunities to be realised along parts of the Parramatta Road and Victoria Road corridors
- Improve network productivity on the metropolitan network, with more trips forecast to be made or longer distances travelled on the network in a shorter time. The forecast increase in vehicle kilometres travelled and reduction in vehicle hours travelled is mainly due to traffic using the new motorway, with reductions in daily vehicle kilometres travelled (VKT) and reduction in vehicle hours travelled also forecast on non-motorway roads
- Reduce travel times on key corridors, such as between the M4 Motorway corridor and the Sydney Airport/Port Botany precinct and between the main centres on the global economic corridor, including Sydney CBD, Sydney Olympic Park and the Parramatta CBD
- Facilitate future growth in Sydney's transport network by allowing for connections to the proposed future Western Harbour Tunnel and Beaches Link, and Sydney Gateway projects.

Investment in the M4-M5 Link, together with the other WestConnex component projects, would assist in facilitating the delivery of other major city-shaping improvements, such as outlined in the *Parramatta Road Corridor Urban Transformation Strategy* and *The Bays Precinct Transformation Plan*, which would all contribute to delivering economic growth. As part of the broader WestConnex program of works, the project would support NSW's major sources of economic activity and provide a strategic response to the future transport demands on the already congested road network, which includes the A3 corridor.

An assessment of the impact of the project on public transport services in the Rozelle interchange study area is provided in section 10.4 of the Appendix H (Technical working paper: Traffic and transport) of the EIS. The results show longer city inbound bus journey times in the AM peak, due to the congested traffic conditions on Western Distributor and Anzac Bridge combined with the increased demands to Bathurst Street and Sydney Harbour Bridge, compared to the 'Without project' case.

In the outbound direction, the Iron Cove Link significantly improves the congestion over Anzac Bridge. As a result, bus journey times reduce in the 'With project' scenario. The forecast reduction in general traffic demand on Victoria Road between Iron Cove Link and Anzac Bridge would provide the opportunity to investigate improving public transport operations, such as extending the existing bus lanes on Victoria Road.

Roads and Maritime will develop a strategy to ensure appropriate network integration in areas surrounding the Rozelle interchange, including Anzac Bridge, Western Distributor and Victoria Road, which will include a review of capacity improvements (see environmental management measure OpTT3 in **Chapter E1** (Environmental management measures)), which is expected to have benefits for all road users, including public transport services.

As with the M4 East and New M5 projects, Roads and Maritime would undertake a Road Network Performance Review, in consultation with Transport for NSW and relevant councils. This would confirm the operational traffic impacts of the M4-M5 Link on surrounding arterial roads and major intersections at both 12 months and five years after opening of the project. The assessment would be based on future updated traffic surveys taken during operation utilising an appropriate methodology following the relevant and industry accepted guidelines current at the time (see environmental management measure OpTT1 in **Chapter E1** (Environmental management measures)). Regardless, those areas that have been identified as being potentially impacted by the project have been identified in Appendix H (Technical working paper: Traffic and transport) of the EIS and would be addressed prior to these operational reviews, or as needed.

In addition to these measures, the forecast reduction in general traffic demand on Victoria Road between Iron Cove Link and Anzac Bridge would provide the opportunity to investigate improving public transport operations along the Victoria Road corridor, such as extending the existing bus lanes on Victoria Road. These improvements do not form part of the project and would be the responsibility of Transport for NSW. The *Draft Greater Sydney Services and Infrastructure Plan* identifies Victoria Road transport improvements as initiatives for investigation within a 10 year horizon (to 2026).

The project would deliver around 3.8 kilometres of new and upgraded pedestrian and cycling infrastructure. Much of this infrastructure would be physically separated from the road network to minimise the interface between pedestrians, cyclists and motor vehicles. This enhancement is considered a major positive impact, as it would result in a significant, long-term change to the social and economic environment, benefiting a large number of people.

C14.9 Economic impacts during operation

498 submitters raised concerns about economic impacts during operation of the project. Refer to section 14.4 and Appendix P (Technical working paper: Social and economic) of the EIS for details of economic impacts during operation.

C14.9.1 Changes to the local economy

Submitters raised concerns that the project would impact the economy of local communities and the economic efficiency of the Sydney CBD through increased traffic, such as on Anzac Bridge. Specific issues raised include:

- Increased traffic entering the Sydney CBD will reduce the economic efficiency of Sydney
- Businesses would have reduced access to human capital and goods and services, which would have a detrimental impact to economic activity and output
- The project would increase inflation, lead to a higher cost of living and a poorer state
- Tolls may deter tourists, negatively impacting the tourism economy
- Tolling costs passed on by businesses through goods and services will have a negative impact on the economy
- The project (through increased traffic) would reduce access to jobs over large areas of the city, undermine the attractiveness of central Sydney to internationally competitive, high productivity firms and their potential employees and therefore adversely affect overall productivity
- The project would cause a loss of trade and measures should be put in place to ensure that acquisition and traffic changes do not unnecessarily reduce trade in Glebe and Forest Lodge.

Response

Economic impact of congestion

The EIS acknowledges that during operation, additional congestion is forecast on Anzac Bridge. However, from a network wide productivity perspective, the addition of the M4-M5 Link would provide a significant overall benefit. An overall increase of 499,000 daily VKT and a reduction of 46,000 daily VHT on the road network are forecast. The economic impacts of this include allowing more trips to be made on the network in a shorter time and motorists to reach their destination in less time, further improving congestion. There would also be substantial overall benefits for freight and commercial vehicle movements from travel time savings due to the operation of the M4-M5 Link project. The subsequent effects of the operation of the M4-M5 Link on business productivity include:

- Reduced cost for commercial and freight movements
- Increased productivity from reduced congestion and travel times for commercial and freight movements
- Increased economic output as a result of increased efficiency in freight and commercial vehicle movements.

Due to the small forecast change in the Sydney CBD with the project and the complexity of the CBD traffic operations, it was not considered appropriate to model the operation of intersections internal to the CBD. The forecast daily traffic demand changes can be seen in Figure 10.1 and 10.2 of Appendix H (Technical working paper: Traffic and transport) of the EIS and the forecast AM and PM peak hour traffic demand changes can be seen in Figure 3 and Figure 4 of Annexure B (Justification of modelled areas) of Appendix H (Technical working paper: Traffic and transport) of the EIS. These figures illustrate that the main changes are focused on the Western Distributor/Sydney Harbour Bridge and Sydney Harbour Tunnel/Eastern Distributor, with minimal changes forecast within the CBD (refer to **section B10.8.6** for further information). The economic impacts of these traffic changes would therefore also be minimal.

Management measures associated with road network performance constraints as a result of the project have been identified, including the development of a strategy by Roads and Maritime to ensure appropriate network integration in the areas surrounding the Rozelle interchange, including Anzac Bridge. The strategy will include a review of capacity improvement measures, project staging options and demand management measures (see environmental management measure OpTT3 in **Chapter E1** (Environmental management measures)).

For freight road users, the project would improve the existing network conditions which would beneficially affect a large number of businesses within the region. Effects would be long-term, and benefit the Greater Sydney Region, as well as the Sydney CBD. The WestConnex program of works is expected to deliver the following benefits to freight vehicle users (in discounted terms), including:

- Reliability benefits valued at over $633 million
- Vehicle operating cost benefits valued at over $2.9 billion
- Travel time savings valued at over $5.9 billion.[2]

Tolls would escalate up to a maximum of four per cent or the consumer price index (CPI) per year (whichever is greater) until 2040. After that, CPI only would apply. Inflation is influenced by broad national economic trends and is regulated in part by the Reserve Bank of Australia. It is not considered that the project would have a significant impact on inflation.

For commuters accessing major employment centres, the project would lead to a more reliable road network, reducing commuting time and lowering vehicle operating costs. For the residents of western Sydney, in particular, this would result in a major positive impact on the social and economic environment.

Business amenity

Reductions in freight or heavy vehicle traffic movements along surface roads in the study area, particularly Parramatta Road, City West Link, Victoria Road, King Georges Road and the existing M5 East Motorway, have the potential to improve the amenity of the environment, which in turn benefits residential communities, visitors and businesses.

[2] Sydney Motorway Corporation 2015, WestConnex Updated Strategic Business Case

Improved road and active transport networks during operation of the project would generally increase the ability for customers to access local businesses. The reduction in traffic may activate the commercial areas by allowing more passing trade and foot traffic, however this may also reduce passing vehicular trade. There would be no permanent impacts on on-street parking near business and commercial areas proposed as part of the project.

For businesses, operation of the project would lead to a more reliable road network, reducing commuting time and lowering vehicle operating costs. Effects would be long term, and benefit the Greater Sydney Region, particularly residents and businesses in western Sydney. This would result in a major improvement in regional connectivity as a result of the project.

Tolling

A more detailed response to tolling impacts is provided in **section C14.9.2**. As a free surface road alternative remains available to all motorists, the tolled motorway is not expected to impact on tourists or the contribution of tourism to the local economy.

Further, tolls charged to commercial and freight operators would not necessarily be passed on to communities. Although tolls would be an added cost to businesses, the benefits of using the tolled motorway, such as increased accessibility and connectivity, has the potential to generally reduce delivery times, increase delivery reliability and as a result reduce overall transport costs. Businesses would also have the choice of using the free surface road network.

C14.9.2 Cost of tolling on businesses and individuals

Submitters raised issues regarding the cost associated with WestConnex and M4-M5 Link tolls on individuals and communities including:

- General concerns over the affordability of tolls and increasing tolls in the future, including increases above the inflation rate
- The burden of the tolls will be on the residents of western Sydney, where the project is not needed or wanted and where people have generally lower incomes than people living in inner-city suburbs
- The cost of tolls is projected to increase by four per cent per year, which is higher than CPI and wages will not keep up with the increasing toll prices, exacerbating affordability issues
- The project discriminates against commuters, such as young people, who cannot afford to pay tolls, do not have access to public transport alternatives, and will be forced to travel on slower congested routes
- Motorists would be reluctant to use tolled tunnels due to costs, and tolls should be removed or charged at minimal fee to encourage usage
- A toll would impose an adverse financial burden on residents of the Illawarra, including Wollongong and Shellharbour, who are dependent on the M1 to travel north
- Tolls would impact on cost of living and result in an economic burden
- Increased toll costs would have a negative financial impact on businesses who will be required to use the toll roads daily
- The project would result in decades of expensive tolls.

Response

The SEIA discusses the potential for impacts upon communities and social equity generally arising from the imposition of tolls on the project. Despite the potential cost to individuals, overall, the benefits of decreased travel times and freight efficiency were assessed as providing a positive benefit for the Greater Sydney Region. A free alternative route is always available for those who choose not to use the tolled motorway.

A tolled motorway applies a 'user-pays' principle to the provision of the faster alternative route compared to existing routes. This principle aims to fund the improved infrastructure through contributions from those who would benefit the most, rather than paying for the project out of general government revenue which is raised from tax payers across NSW, not just those in Sydney that would benefit. This model is considered fair by Transport for NSW as the NSW Government alone cannot fund all infrastructure investment required in NSW. This model also accords with the Australian Government's *National Public Private Partnership Guidelines* (2015), which sets out the basic case for user charging, noting that this allows infrastructure investment to be brought forward. This in turn provides for improved economic growth and efficiencies, providing benefits across the state in both the short and long term.

Key considerations in the approach to tolling are outlined in the *WestConnex Updated Strategic Business Case* and include such elements as: distance based tolling, higher tolls for heavy vehicles and minimum and maximum charges. In setting the toll for the project the NSW Government's tolling principles have been applied, which are:

1) New tolls are applied only where users receive a direct benefit
2) Tolls can continue while they provide broader network benefits or fund ongoing costs
3) Distance-based tolling for all new motorways
4) Tolls charged for both directions of travel on all motorways
5) Tolls charged reflect the cost of delivering the motorway network
6) Tolls take account of increases in expenses, income and comparable toll roads
7) Tolls will be applied consistently across different motorways, to the extent practicable, taking into account existing concessions and tolls
8) Truck tolls at least three times higher than car tolls
9) Regulations could be used so trucks use new motorway segments
10) Untolled alternative arterial roads remain available for customers.

Section 8.6.3 of Appendix P (Technical working paper: Social and economic) of the EIS indicates that lower income households in western Sydney may not be able to afford the tolls for the M4-M5 Link. The broader WestConnex toll charges and cap of $8.60 in 2017 dollars for cars and light commercial vehicles is considered to represent good value based upon the substantial time savings offered for commuters travelling from western Sydney to the Sydney CBD. Tolls would be charged on all users, including heavy vehicles, and would apply in both directions. As such the toll would be incurred by motorists from a broad geographical cross section of Sydney, as well as by heavy vehicles travelling further afield within NSW and interstate, including those travelling to and from Sydney Airport and Port Botany.

Free, alternative traffic routes, such as Parramatta Road, City West Link, King Georges Road, the Hume Highway, Stanmore Road, Sydenham Road and the Princes Highway, would remain available to those who choose not to use the tolled motorway. Motorists who choose to use the existing surface road network would still benefit as the capacity on these alternative routes is forecast to improve (as freight and commercial vehicles are expected to use the motorway tunnels). Individuals will have to weigh up the benefits of using the motorway, which includes travel time savings, a safer option with lower potential for traffic accidents and reduced vehicle operation and maintenance costs, with the financial cost of using the motorway.

This is consistent with the NSW Government's tolling principles. Free, alternative routes, such as Parramatta Road, would remain available to those who choose not to or cannot afford to use the tolled motorway. The use of toll roads is therefore an individual choice.

The project would not affect existing tolls on the M1 (Eastern Distributor) and would not introduce tolls on any section of the M1 north or south of Sydney. As such there would be no change for residents of the Illawarra travelling into or beyond Sydney. Traffic on Southern Cross Drive is predicted to reduce slightly as a result of the project.

In November 2017 (after exhibition of the EIS), the NSW Premier announced[3] a vehicle registration cashback scheme for motorists who spend more than $25 on average per week over a 12 month period on tolls in NSW to claim free vehicle registration. This was in acknowledgement of the cost of living pressures identified by communities. The scheme will be available for standard privately registered cars, utes, four-wheel-drives and motorcycles from 1 July 2018 and be backdated to July 2017. The scheme will not include trucks or other vehicles weighing more than 2,795 kilograms. This is expected to save the majority of motorists who apply to the scheme around $358 a year on registration costs, and some up to $715.

Although road tolling would be a cost to businesses, increased accessibility and connectivity has the potential to generally reduce delivery time, increase delivery reliability and as a result reduce overall transport costs. Businesses would also have the choice of using the free surface road network.

C14.9.3 Property values

Submitters raised concern that operational project elements, including ventilation facilities and new road infrastructure would impact surrounding property values and make it difficult to sell or rent property. Specific areas of concern included:

- Operational infrastructure at Iron Cove Link motorway operations complex (MOC4) impacting property values on Springside Street
- Property values at Haberfield will decrease
- Increased traffic on Gardeners Road will prompt land use planning changes, affecting property values
- The permanent motorway operations complex at Darley Road will reduce property values in the area.

Response

As outlined in section 6.2 of Appendix P (Technical working paper: Social and economic) of the EIS, an assessment of the impact of the project on residential and commercial property prices has not been included in the EIS given the large number of factors that influence the value of a property. It is extremely difficult to anticipate market perceptions, particularly as these in turn are influenced by broader macroeconomic considerations (eg strength of the economy, outlook for economic growth, interest rate levels, availability of finance, unemployment levels). As such, a reliable assessment of the interaction between the project and the property market cannot be made with any certainty.

C14.9.4 Health-related costs

Submitters raised concerns regarding health-related costs as a result of future traffic congestion and particulate pollution from the ventilation facilities.

Response

The EIS considers potential health risks associated with:

- Noise and vibration
- Air quality
- Traffic congestion.

Environmental management measures have been identified to mitigate impacts from the construction and operation of the project such that health impacts are minimised.

[3] http://www.abc.net.au/news/2017-11-20/nsw-government-announces-free-car-rego-for-toll-road-users/9168264?_sm_au_=iVVBJBrjPNlfQRJq

Overall, Appendix K (Technical working paper: Human health risk assessment) of the EIS found that the project is expected to result in a decrease in total pollutant levels in the community. The project is expected to result in a redistribution of impacts associated with vehicle emissions, specifically in relation to emissions derived from vehicles using surface roads. For much of the community this would result in no change or a small improvement (ie decreased pollutant concentrations and associated health impacts), however for some areas located near key surface roads, a small increase in pollutant concentration may occur. Potential health impacts associated with changes in air quality (specifically nitrogen dioxide and particulates) within the local community have been assessed and are considered to be acceptable.

On this basis it is not expected that health-related costs would increase as a result of the project.

C14.10 Displacement

109 submitters raised concerns about displacement of businesses and residents as a result of the project. Refer to section 14.4 and Appendix P (Technical working paper: Social and economic) of the EIS for details of displacement.

C14.10.1 Community impacts from property acquisition

Submitters have raised concerns regarding the community impacts of displacement, caused by residential property acquisitions, and people leaving local areas to avoid project impacts.

Response

The project has been designed and developed to minimise the need for surface property acquisition by:

- Locating large sections of the project, including the Rozelle interchange, below ground
- Utilising areas that are within the project footprint of the M4 East and New M5 projects, where possible
- Utilising government owned properties where possible, such as at the Rozelle Rail Yards and Darley Road civil and tunnel site (C4).

Surface property acquisition is required for the project for the following reasons:

- The project is located in a developed, urban environment and there is limited nearby land that is undeveloped and suitable for the project
- Land is required for mid-tunnel sites (such as Darley Road civil and tunnel site (C4) and Pyrmont Bridge Road tunnel site (C9)) to expedite tunnelling and shorten the construction period for the project
- The increased capacity of surface roads and the construction of new interchanges require road widening and associated acquisition of land adjacent to the road corridor.

The need to reduce surface property acquisitions has been balanced with maximising opportunities for beneficial re-use of the areas required for construction that would be surplus to the operational needs of the project. Notwithstanding this design intent, construction and operation of the project would result in temporary and permanent impacts on property.

All acquisition required for the project would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW), the *Land Acquisition Information Guide* (NSW Government 2014) and the land acquisition reforms announced by the NSW Government in 2016, available online[4].

Overall, 26 residential properties are proposed to be acquired for the project and 48 businesses are being required to be removed from their existing premises. It is acknowledged that acquisition of property may cause social impacts such as stress associated with household relocation, difficulty in obtaining similar housing in the same area at a comparable cost, altered access to social infrastructure, loss of community cohesion and impact on family and social networks.

[4] http://www.propertyacquisition.nsw.gov.au/

A Community Communication Strategy will be prepared and would detail the property acquisition support services that would be provided to affected residents. In addition:

- Affected households will continue to have access to a counselling service that assists people through the property acquisition process
- An independent service will continue to be provided to vulnerable households (eg elderly, those suffering an illness) to assist with relocation. Assistance could include finding a suitable house for relocation, arranging removalists, disconnecting services and attending appointments with solicitors or other representatives
- A community relations support toll-free telephone line will be operated to respond to any community concerns or requests for translation services.

C14.11 Compensation

511 submitters raised concerns regarding the compensation process during construction and operation of the project.

C14.11.1 Compensation for impacted receivers

Submitters have raised concerns that homeowners and tenants were not being adequately compensated during construction and operation of the project. Specific concerns and requests raised include:

- There is no clear compensation process outlined in the EIS
- Request for compensation due to the following impacts:
  - Loss of value to property or rental loss
  - Health impacts such as anxiety and stress
  - Pollution
  - Disruption to lives
  - Noise and vibration
  - Property damage
  - Inconvenience
  - Loss of wellbeing and quality of life
- Residents and schools should be compensated for implementing measures to manage impacts
- Concern that large corporations will refuse to compensate property owners
- What the timeframe for cut-off of compensation claims would be
- Whether residents would be required to go to court to claim compensation
- Request assurance that should the project propose any danger or increased risk to public safety or health, that the project will fully compensate and make acceptable improvements and changes that address the problems
- Cinema tickets are a poor compensation offer for 24 hours, seven days a week disruption to the community
- Objection to the process for compensating damage to properties caused by tunnelling
- The proponent should pay a pre-determined amount ex gratia payment to residents for each night of disturbance
- SMC should pay for the clean-up of all areas affected by construction, for example, houses soiled by dust
- Request that the government should implement a remediation scheme for houses damaged during construction

- Who would be responsible for compensation from cumulative impacts from other tunnelling projects?
- The EIS is vague on compensation
- Concern about the likely amounts of compensation coming from state budgets as a result of property acquisitions and the compensation already being paid to existing tollway businesses
- A compensation fund should be established to protect and repair homes and schools from damage caused by construction and to address health impacts and illnesses caused by construction and the operation of the tunnel in Rozelle, Lilyfield, Balmain and Drummoyne
- Alternative living arrangements and compensation will need to be considered if this construction goes ahead at the Pyrmont Bridge Road tunnel site (C9).

Response

Roads and Maritime acknowledge that the project will result in a number of impacts and the EIS indicates that the project will result in a number of impacts to local communities, particularly during the construction phase. Management measures to minimise and mitigate disruptions and other impacts related to construction and operation of the project are summarised in **Chapter E1** (Environmental management measures).

All compulsory acquisition required for the project would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW), the *Land Acquisition Information Guide* (NSW Government 2014) and the land acquisition reforms announced by the NSW Government in 2016 (NSW Government 2016). Relocation and some other categories of expenses could be claimable under this Act and related policies. However, it is NSW Government policy that monetary compensation not be paid for construction related impacts as these are temporary and need to be managed in accordance with the management measures identified for the individual projects. Roads and Maritime acknowledge that while construction is temporary, construction activities can occur over a long duration. Construction impacts need to be weighed against the longer term benefits of the project, once operational.

Roads and Maritime follow a process for determining compensation which includes consultation with the affected party, property damage surveys and determination of remedial actions. These measures are outlined in **Chapter E1** (Environmental management measures).

For businesses the project's compensation process has been designed in accordance with the *Determination of compensation following the acquisition of a business guideline* (NSW Government date unknown). This guideline provides direction to all NSW acquiring authorities in determining compensation for a business conducted on land that is acquired in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW). It is acknowledged in the guide that each case for business interest compensation should be considered on its individual merits. The business interest may be in the same ownership as the "land" or may be a non-related party.

Building condition surveys will be offered to property owners within the zone of influence of tunnel settlement (50 metres from the outer edge of the tunnels and within 50 metres of surface works) or as otherwise directed by the Independent Property Impact Assessment Panel (see environmental management measure PL11 in **Chapter E1** (Environmental management measures). Building condition surveys of properties will be carried out prior to the commencement of any project works in the vicinity that have the potential to result in damage to the properties, as identified by the contractor and confirmed by the Independent Property Impact Assessment Panel. Building condition surveys will be carried out by a structural engineer.

In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified. Any disputes between a property or infrastructure owners regarding damage and rectification will be referred to the Independent Property Impact Assessment Panel (see environmental management measure PL11 in **Chapter E1** (Environmental management measures) for resolution. All works would be undertaken at no cost to the affected property owner.

The project would not provide financial compensation for the cost associated with loss of rental income or changes to property values. The project instead proposes to manage the potential impacts associated with construction through the implementation of the measures summarised in **Chapter E1** (Environmental management measures). Residents and schools would not be required to implement environmental management measures at their own expense. This would be the responsibility of Roads and Maritime.

Cumulative impacts of settlement are discussed in **section C12.11**.

C14.12 Cumulative social and economic impacts

1,749 submitters raised concerns about longer duration construction impacts on communities at Haberfield and St Peters. Refer to section 26.4 and Appendix P (Technical working paper: Social and economic) of the EIS for an assessment of cumulative social and economic impacts.

C14.12.1 Longer duration construction impacts at Haberfield/Ashfield and St Peters/Newtown

Submitters raised concern regarding construction fatigue affecting the local communities impacted by construction from several consecutive or concurrent projects for five or more years. Specific concerns include:

- Residents would have prolonged period of exposure to more than one project due to overlaps in the construction periods of the WestConnex program of works and that this has been described as a temporary impact in the EIS
- Disruption of communities, children in schools, inconvenience and general health and wellbeing impacts
- Residents will be exposed to prolonged periods of noise and sleep disturbance from construction which they have already been experiencing for years
- No additional mitigation or any compensation is offered for residents for these periods
- Neither Option A nor Option B minimise impacts on Haberfield, but extend, by four or more years, the impacts of WestConnex construction upon residents, services and businesses
- Impacts on businesses and residents at King Street at Newtown from WestConnex.

Submitters were also concerned about commitments made for the M4 East project that were not a part of the M4-M5 Link project. Specific concerns included:

- The EIS does not include or analyse the promised option made during consultation for M4 East, that there would be no additional above ground sites required for the M4-M5 Link. The M4-M5 Link project should use the new portals built for the M4-M5 Link at Wattle Street. Submitter requested that the proposed option of no additional surface sites in Haberfield/Ashfield for the M4-M5 Link be incorporated into the EIS to minimise surface impacts of construction on residents
- References to signage indicates that commitments of streets being returned to residents is false
- The works in Haberfield would continue until 2022, which is a breach of the assurances given to community's that works would be completed in 2019.

Response

Longer duration construction impacts are expected where the project connects to the M4 East and New M5 projects at Haberfield/Ashfield and St Peters respectively. Chapter 26 (Cumulative impacts) of the EIS comprises a detailed cumulative impact assessment. Furthermore, respective technical working papers including traffic and transport (Appendix H (Technical working paper: Traffic and transport), noise and vibration (Appendix J (Technical working paper: Noise and vibration) and air quality (Appendix I (Technical working paper: Air quality) of the EIS include consideration of consecutive and concurrent (cumulative) impacts during construction and operation of the project. The outcomes of the respective assessments of cumulative impacts were then used to inform the development of management and mitigation measures (see **Chapter E1** (Environmental management measures)).

Roads and Maritime acknowledge that the impacts from construction of the WestConnex program of works at Haberfield/Ashfield and St Peters are not short term, as the consecutive construction of components of the WestConnex projects would extend the duration of impacts to a period of up to seven years for some receivers in these areas. The range and intensity of impacts have and would continue to vary during these periods as construction progresses, with the majority of impacts occurring or expected to occur as a result of certain construction activities and during certain times of the day (for example outside standard daytime construction hours).

Key impacts resulting from longer duration construction in these areas may include noise and vibration, including ground-borne noise from tunnelling, construction traffic including spoil haulage, dust, visual impacts and impacts on parking on local streets around construction sites. Construction activities most likely to result in longer duration impacts as a result of 24 hours a day, seven days a week operation or over an extended period of time include surface road works, utility works, tunnelling and tunnelling support (such as spoil handling and transport).

The majority of intensive utility and civil construction works (including surface road works) around Haberfield/Ashfield and St Peters will be completed as part of the M4 East and New M5 projects respectively. In addition, in many instances, M4 East and New M5 construction will transition to less intensive works as the respective construction programs progress towards their conclusion and tunnelling is completed. These less intensive activities include mechanical and electrical fitout, pavement and linemarking works and landscaping, which would occur prior to or at the same time as M4-M5 Link site establishment works commence.

This means that construction activities that overlap or occur consecutively from these projects and the M4-M5 Link would generally be less intensive and cause less disturbance to nearby communities. In addition, these works would typically be expected to require less road occupations (except for line marking and pavement works) and therefore would be more likely to occur during standard construction hours. In addition, at the completion of construction of the M4 East and New M5 projects, permanent noise treatments would be established and/or installed as required by the conditions of approval for these respective projects. This would include (where required by the conditions) the installation of at-receiver treatments and the establishment of permanent noise barriers. The noise modelling that has informed these at-receiver treatments is based on a cumulative scenario that includes the additional traffic forecast for the M4-M5 Link project. These treatments would assist in ameliorating construction noise impacts on these receivers.

Around Haberfield and Ashfield, the majority of the above-ground infrastructure required for the M4-M5 Link project is currently being built by the M4 East project. The large civil construction works such as the construction of the Wattle Street and Parramatta Road entry and exit ramps and associated civil construction works on Wattle Street and Parramatta Road, as well as the Parramatta Road ventilation facility (including the outlet for the M4-M5 Link project) will be complete or nearing completion before construction of the M4-M5 Link commences. This includes the construction of the M4-M5 Link entry and exit ramps along Wattle Street, including the dive and cut-and-cover structure.

Around St Peters, clean-up of the Alexandria Landfill site, construction of the St Peters interchange as well as construction of a component of the above ground infrastructure required for the M4-M5 Link project is being carried out by the New M5 project. This includes construction of the M4-M5 Link entry and exit ramps, upgrades of the local roads (including Campbell Road) and the provision of a construction hardstand area and construction access driveway that will be reused for the Campbell Road civil and tunnel site (C10).

The M4-M5 Link project will need to carry out some civil construction works (including construction of the Campbell Road ventilation facility) and civil finishing works for infrastructure at Haberfield and St Peters. However, construction of surface infrastructure at both locations as part of the M4-M5 Link project has been minimised as much as practicable.

To further manage the impacts associated with longer duration construction impacts from the concurrent construction of the WestConnex component projects in these areas and to respond to issues raised during the construction of other WestConnex projects and in submissions on the M4-M5 Link EIS, the following strategies are proposed:

- Provision of additional off-street car parking for the construction workforce at Rozelle, with the use of the White Bay civil site which would provide around 50 parking spaces. This site is further described in **Chapter D2** (White Bay civil site (C11))
- Using the Northcote Street civil site (C3a) for construction workforce car parking and laydown. Currently this site is used as the main tunnelling site for the eastern end of the M4 East project
- Reducing the surface construction footprint of the Wattle Street civil and tunnel site (C1a) to limit surface construction activities to the Wattle Street entry and exit ramps. Compared to the indicative layout presented in Chapter 6 (Construction work) of the EIS for this site, this would reduce potential construction impacts such as noise and vibration and dust during construction of the M4-M5 Link project and would also allow for realisation of the M4 East urban design and landscaping outcome for this area at the completion of the M4 East project

- Provision of a heavy vehicle truck marshalling facility at the White Bay civil site (C11) at Rozelle, which would cater for around 40 heavy vehicles and stage the release of trucks to the tunnelling sites to manage the arrival of trucks to construction ancillary facilities (see **Part D** (Preferred infrastructure report)). Provision of a truck marshalling facility and additional construction workforce parking would result in several benefits for the community and the project, including:
  - Reducing potential queuing and circling on local roads surrounding the project and associated construction ancillary facilities
  - Providing additional construction workforce parking spaces which would minimise the need for construction workers parking on local roads
  - Minimising disruptions to the road network around construction ancillary facilities and noise and other disturbance to the local community including residential, business and commercial properties
  - Improving safety for construction workers, motorists and the general public by providing a controlled area from which project traffic schedulers can manage trucks and direct truck drivers to the construction ancillary facilities as required
- Development of a car parking strategy that will quantify construction workforce parking demand, identify public transport options (and measures such as carpooling and shuttle-buses) and identify all locations that will be used for construction workforce parking (see environmental management measure TT04 in **Chapter E1** (Environmental management measures))
- Development and implementation of a truck management strategy that will identify potential truck marshalling areas that will be used for the project and describe management measures for project-related heavy vehicles to avoid queuing and site-circling in adjacent streets and other potential traffic and access disruptions (see environmental management measure TT16 in **Chapter E1** (Environmental management measures))
- Designing acoustic sheds with consideration of the activities that will occur within them and the relevant noise management levels in adjacent areas. Monitoring will be carried out to confirm that the actual acoustic performance of the sheds is consistent with predicted acoustic performance (see environmental management measure NV7 in **Chapter E1** (Environmental management measures))
- The appointment of a suitably qualified and experienced acoustics advisor, who is independent of the design and construction personnel, and who will be engaged for the duration of construction of the project (see environmental management measure NV1 in **Chapter E1** (Environmental management measures))
- Use of the M4 East and New M5 tunnels for spoil haulage when they become available and where practicable, to minimise heavy vehicle movements on the surface road network
- Consideration of receivers that qualify for assessment for at-receiver treatment due to predicted operational road traffic noise that are also predicted to experience exceedances of noise management levels during construction for at-receiver treatments as a priority (see environmental management measure NV9 in **Chapter E1** (Environmental management measures)).

Specific management and mitigation will be documented in relevant construction environmental management sub-plans such as the Ancillary Facilities Management Plan and the Construction Traffic and Access Management Plan. This will include detailed consideration of the types of activities that would be most likely to cause longer duration impacts during construction of the project, the types of impacts already experienced by these communities as a result of M4 East and New M5 construction, and subsequent development and implementation of location and activity specific mitigation that considers the consecutive nature of construction at these locations.

A response to the concern raised regarding compensation for affected receivers is included in **section C14.11.1**.

The non-Aboriginal heritage assessment for the M4 East project determined that given the major adverse impact of the project on the Haberfield HCA, further works within the Haberfield HCA should be avoided. The EIS for the M4-M5 Link project does not propose any additional construction compounds that are located within the Haberfield HCA. The proposed construction sites on the eastern and western side of Parramatta Road are outside the boundary of the Haberfield HCA, on land owned by Roads and maritime, and have historically been used for commercial purposes. Justification for the proposed use of these construction sites is discussed in **section C6.3**.

Based on community feedback and concerns raised in submissions on the EIS, a number of refinements to the construction ancillary facilities at Haberfield and Ashfield have been made to further minimise impacts on the community and sensitive receivers. This includes:

- Wattle Street civil and tunnel site – no surface components (no car park area, laydown area or site offices). All work would be undertaken below ground with access via the Wattle Street ramps constructed by M4 East project
- Haberfield civil site – footprint reduced and site to be used as a civil site only as per the arrangement for the Haberfield civil site (C2b). The C2a option would therefore not be used for the construction of the project. No tunnelling from this site is proposed. This would allow the M4 East UDLP and Residual Land Management Plan in the area around Wattle Street and Walker Avenue at Haberfield to be completed earlier.

The appointed design and construction contractor(s) may choose to use all or some of the construction ancillary facilities identified in the EIS, including any combination of the Option A and Option B facilities at Haberfield/Ashfield. The construction ancillary facilities proposed to be used by the contractor will be documented in an Ancillary Facility Management Plan which would be approved by the Secretary of DP&E.

Additional ancillary facilities may be proposed by the design and construction contractor(s). Prior to the establishment of ancillary facilities that are not approved, the contractor would need to comply with any relevant conditions of approval. Additional sites may be subject to separate environmental assessment and approval, subject to the extent of environmental and social impacts. Approval pathways are described further in Chapter 2 (Assessment process) of the EIS.

Wayfinding signage for the road infrastructure will be developed to the satisfaction of Roads and Maritime. Consultation will occur with the relevant local council regarding road signs for council roads. Signage for road infrastructure will be installed prior to the commencement of operation.

Traffic, locational, directional, warning and variable message signs would be incorporated within the tunnels and on surface roads at approaches to the tunnels. Variable message signs would be located within or directly adjacent to areas of operational infrastructure for the project and the existing adjacent arterial road network. Directional signage would be installed in accordance with the Austroads and Roads and Maritime standards, with a focus on providing clear and unambiguous direction to motorists.

The M4 East EIS acknowledges that the construction of the multiple stages of WestConnex would be staggered and would therefore result in extended construction periods for some residents in the vicinity of the project. This includes where consecutive construction periods would occur, particularly at Haberfield for works associated with the M4-M5 Link project. Construction for the M4 East project is expected to be completed in 2019.

C14.12.2 Longer duration construction impacts at Rozelle

Submitters raised concern regarding construction of the M4-M5 Link project overlapping with the Western Harbour Tunnel and Beaches Link program of works and impacting the sensitive receptors and local communities at Rozelle for many years.

Response

At Rozelle, the Rozelle Rail Yards site management works have commenced and will occur over a period of 12 months and would be completed by mid-2018, prior to the start of construction works for the M4-M5 Link project. The CBD and South East Light Rail maintenance depot adjoining the proposed Rozelle civil and tunnel site (C5) to the west is expected to be completed by early 2018, also prior to start of construction works for the M4-M5 Link project.

The potential long term duration social and economic impacts associated with consecutive use of the Rozelle Rail Yards for construction of the M4-M5 Link and the future proposed Western Harbour Tunnel is assessed in section 9.3 of Appendix P (Technical working paper: Social and economic) of the EIS.

Details regarding construction of the proposed future Western Harbour Tunnel project, including proposed timeframes for construction, are not available at this time as the project is in the early stages of design development. For the purposes of the cumulative assessment for the M4-M5 Link project, it was assumed that there would be a construction site for the proposed future Western Harbour Tunnel within the central portion of the Rozelle Rail Yards site, and construction work would commence at the end of 2019 and continue through until around 2025. Table 9-5 in Appendix P (Technical working paper: Social and economic) shows indicative construction timeframes at Rozelle from 2018 to 2020. This is an error and the table should include the years 2021, 2022 and 2023 to show the overlap between construction at the Rozelle Rail Yards for the M4-M5 Link and proposed future Western Harbour Tunnel. This clarification is also provided in **section A4.2.9**.

Roads and Maritime acknowledge that the impacts from construction of these two projects at Rozelle would not be short term, as the consecutive construction of these projects would potentially extend the duration of impacts to a period of up to seven years for some receivers in this area. The range and intensity of impacts have and would continue to vary during these periods as construction progresses, with the majority of impacts occurring or expected to occur as a result of certain construction activities and during certain times of the day (for example outside standard daytime construction hours).

The SEIA acknowledges that during construction, the presence of heavy vehicles would affect access and general amenity for road users, residents, business owners, social infrastructure users and visitors, including around the Rozelle civil and tunnel site. Around 520 daily heavy vehicles (one way) are forecast during construction to service the Rozelle civil and tunnel site (C5) (refer to Table 7-15 in Appendix H (Technical working paper: Traffic and transport) of the EIS). To reduce traffic and amenity impacts on local roads, spoil haulage routes would operate mainly on arterial roads including City West Link and The Crescent at Rozelle (refer to Figure 6-29 of the EIS). The indicative spoil haulage route may vary based on the final construction methodology and program.

The Bays Precinct Urban Transformation Plan provides a strategy for redevelopment of The Bays Precinct over a period of 20-25 years. Planning for The Bays Precinct is still in early stages and as such it is not possible to accurately assess the cumulative construction impacts that may arise. There are presently no construction details available for these future projects and any potential consecutive impacts would be required to be assessed and managed as outlined in the environmental assessment for these projects.

Upon operation, the project would deliver an integrated motorway and local road network that would provide substantial benefits to communities in Sydney's inner west by improving community connectivity on local roads through transferring traffic and heavy vehicles from surface roads, to underground.

C14.13 Social and economic environmental management measures

834 submitters raised concerns about the environmental management measures for social and economic impacts. See **Chapter E1** (Environmental management measures) for further details on the social and economic environmental management measures.

C14.13.1 Environmental management measures

Submitters raised concerns regarding the lack of additional mitigation for residents in regards to the cumulative impacts of construction from the overlapping construction period with the M4 East and New M5 projects. Concern has also been raised regarding the validity and effectiveness of social and economic mitigation measures due to disappointment with preceding WestConnex stages. Specific concerns include:

- Lessons learnt from Stages 1 and 2 of WestConnex should be included in the social and economic mitigation measures for Stage 3 [the M4-M5 Link]
- Mitigation for residents experiencing construction fatigue is inadequate

- Adequate notice should be provided to potentially affected businesses of staging of construction works. This could be included in a stakeholder communication plan
- Mitigation for the Pyrmont Bridge Road tunnel site impacts on Bridge Road School should be provided.

Submitters recommended the following measures be put in place to manage impacts on residents around the Haberfield/Ashfield construction sites:

- Establish a curfew for project work after 11.00 pm
- Urgent night-time road work or road utility access should be permitted by Roads and Maritime/Traffic Management Centre to commence from 7.00 pm and to cease by 11.00 pm
- Effective and widespread mitigation measures to ensure our children's health, safety and learning is not adversely affected are implemented
- A process be implemented before construction begins, for Haberfield Public School to report disruptions to children's learning, health or safety and receive instant action to end the disruption.

Response

The SEIA addressed potential cumulative effects from longer term construction impacts (ie construction fatigue), particularly in areas subject to construction impacts from the M4-M5 Link project and other WestConnex component projects, such as the M4 East and New M5 projects at Haberfield/Ashfield and St Peters respectively. Feedback from other SMC project teams, design and construction contractor(s) and DP&E was sought on the M4 East and New M5 construction phases to identify lessons learnt and areas for improvement to work processes and mitigation measures to assist in addressing potential cumulative impacts.

Multiple community and stakeholder consultation sessions were held for the M4-M5 Link project prior to and during preparation of the concept design report and EIS, and throughout the Submissions and preferred infrastructure report process for the project. This included hosting sessions at Haberfield and Newtown, where communities currently being affected by the M4 East and New M5 construction works were able to provide feedback to the project team. A detailed summary of community and stakeholder consultation undertaken for the project is included in Chapter 7 (Consultation) of the EIS.

See **section C14.12** for further discussion regarding the potential cumulative impacts that would be experienced at Haberfield and St Peters, and how these would be managed. A full list of environmental management measures to manage potential social and economic impacts from the project are summarised in **Chapter E1** (Environmental management measures).

Other social and economic mitigation measures related to business impacts and impacts on social infrastructure (such as schools) are discussed below.

A Business Management Plan will be prepared and will include:

- Identification of businesses that have the potential to be adversely affected by construction activities that will occur as part of the project
- Management measures that will be implemented to maintain appropriate vehicular and pedestrian access during business hours and visibility of the business to potential customers during construction, including alternative arrangements for times when access and visibility cannot be maintained. These will be determined in consultation with the owners of the identified businesses.

A Community Communication Strategy will also be prepared that details:

- Procedures and mechanisms that will be implemented in response to the key social impacts identified for the project
- Property acquisition support services that will be provided
- Procedures and mechanisms to communicate to project stakeholders (including affected communities), the access and connectivity enhancements and new community and social facilities that will be delivered as part of the project through the Social Infrastructure Plan and to update stakeholders on delivery progress
- Procedures and mechanisms that will be used to engage with affected business owners to identify potential access, parking, business visibility and other impacts to develop measures to address potential impacts on a case by case basis.

Potential impacts to Bridge Road School during construction are identified in Table 7-5 of Appendix P (Technical working paper: Social and economic) of the EIS. Proximity of the school to Parramatta Road, which is a heavily trafficked arterial road, already compromises the amenity of the school. An acoustic shed would enclose tunnelling activities (including spoil handling) at the Pyrmont Bridge Road tunnel site (C9), which would minimise noise and dust generation. All heavy vehicle access would be via Parramatta Road and Pyrmont Bridge Road. Provision for truck marshalling and construction workforce parking would also be provided at the White Bay civil site (C11) which would also minimise the impacts of traffic and parking on the school. The White Bay civil site is an additional construction ancillary site for the project at Rozelle and is described and assessed in **Chapter D2** (White Bay Civil Ste (C11)).

Haberfield Public School would likely be impacted during construction from increased construction vehicle movements along Bland Street due to the proximity of the school and the Parramatta Road East civil site (C3b). Increases in traffic may reduce roadside safety, particularly in areas heavily frequented by pedestrian and cyclists, such as near Haberfield Public School.

Environmental management measures to manage potential impacts to Bridge Road School and Haberfield Public School would be included as part of the Social Infrastructure Plan for the project. The Social Infrastructure Plan is proposed to manage, minimise and avoid potential construction impacts. The Plan will be prepared before construction with the following provisions proposed for inclusion:

- Identify social infrastructure that has the potential to be adversely affected by construction activities
- Develop, in consultation with the owners of the identified social infrastructure, measures that could be implemented to maintain appropriate vehicular and pedestrian access, management measures for noise exceedances and safety measures, particularly around areas where children are present.

The Social Infrastructure Plan is proposed to be prepared by a suitably qualified and experienced person in consultation with the community and relevant councils and implemented as part of the project.

In developing construction methodologies and a construction program for the project, the aim has been to minimise the duration of the construction period, while maintaining an acceptable and manageable amenity outcome for surrounding receivers. This has required a balance between the speed of construction activities and the ability to reasonably and feasibly manage potential impacts within acceptable limits.

Tunnelling and associated tunnelling support construction activities (including spoil haulage) would occur 24 hours per day, seven days per week. The exception to this would be at the Darley Road civil and tunnel site (C4), where tunnelling, along with spoil management within an acoustic shed, would occur 24 hours per day, seven days per week. However, spoil haulage would occur during standard construction hours only.

The majority of above ground construction activities would be carried out during standard construction hours wherever practicable. However, some construction activities are required to be carried out outside of standard construction hours. The justification for these out-of-hours works is included in section 6.7.2 of the EIS and includes:

- To ensure public and construction worker safety
- To minimise impacts on the function and safety of the road network, including along key arterial routes such as Parramatta Road, Wattle Street, City West Link and Victoria Road, which is a key construction objective for the project
- To allow for spoil haulage to occur outside of the AM and PM peak periods where practicable, reducing the impact of these vehicles on the operability of the surface road network
- To carry out utility works, including works that require temporary disruption to services, at times of the day which would cause the least inconvenience.

Construction outside standard construction hours in certain circumstances (included those listed above) is standard practice for major infrastructure projects in NSW. In addition, the majority of the works which are being undertaken outside standard construction hours are located below ground (ie tunnelling). Opportunities to further reduce construction timeframes while protecting local amenity would be considered during detailed design and construction planning.

Further, an out-of-hours works protocol will be developed for the construction of the project. The protocol will include:

- Details of works required outside standard construction hours, including justification of why the activities are required outside standard construction hours
- Measures that will be implemented to manage potential impacts associated with works outside standard construction hours
- Location and activity specific noise and vibration impact assessment process(es) that will be followed to identify potentially affected receivers, clarify potential impacts and select appropriate management measures
- Details of the approval process (internal and external) for works proposed outside standard construction hours.

C14.14 General

128 submitters raised concerns about general social and economic impacts.

C14.14.1 General social and economic impacts

Submitters raised concerns regarding the general adverse impacts of the project and WestConnex on the community. Concerns raised include:

- General disruption to communities
- Impacts caused by increased traffic, pollution and noise
- Community angst due to the uncertainty of the project
- General impacts to the intrinsic value of local areas.

Areas of concern included Haberfield, Ashfield and Five Dock.

Submitters have also voiced general support for the project, stating the positive impact the project will have on safety, the social and cultural environment, amenity and economic benefits.

Response

See **section C14.2** to **section C14.14** for response on specific social and economic impact issues related to construction and operation raised in submissions. In particular see **section C14.2** and **section C14.6** for responses relating to community amenity impacts. See section **C11.16.2** for a response to concerns regarding stress and anxiety due to uncertainty regarding construction activities.

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C15 Soil and water quality

This chapter addresses issues raised in community submissions associated with the soil and water quality assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 15 (Soil and water quality) and Appendix Q (Technical working paper: Surface water and flooding) of the EIS for further detail on the soil and water quality assessment.

Contents

C15.1 Level and quality of soil and water quality assessment

95 submitters raised concerns about the soil and water quality assessment. Refer to section 15.1 of the EIS, Appendix Q (Technical working paper: Surface water and flooding) of the EIS and Appendix R (Technical working paper: Contamination) of the EIS for details of the soil and water quality assessment methodology.

C15.1.1 Concern regarding methodology and adequacy of assessment of soil and water quality

Submitters raised concern about the adequacy and independence of the soil and water quality impact assessment in the EIS. Specific concerns included:

- The environmental impact of discharging water from the tunnels into the stormwater canal near Blackmore Park (ie into Hawthorne Canal) has not been adequately assessed in the EIS
- Concern over the adequacy of the geological assessment. It presents an oversimplified and possibly incorrect model which ignores a number of dykes present at Rozelle and other geological formations and does not reference a number of important reference papers
- The EIS does not identify the risk of water pollution from heavy rain events for sites that are immediately adjacent to waterways. Sediment ponds may not have sufficient capacity or become compromised by physical constraints to be effective in heavy rain events. The EIS has not considered this as it is based off ideal conditions rather than practical experience
- In relation to water quality, the EIS does not accurately assess risks due to spillages, excess discharges, overflows and flood events
- The EIS does not identify the impact of the project on the Iron Cove Creek
- Details of the geotechnical assessment should be released to the public
- Inadequate surface water and groundwater details are contained within the EIS to assess whether a NSW Environment Protection Authority (NSW EPA) licence would be required
- The EIS contains limited information on performance specifications of each groundwater treatment plant. The EIS is also not adequate to determine the ability of the water treatment plants to treat a range of pollutants and saline water
- The EIS has not assessed the contaminated water and the chemicals from the discharge of treated water into Whites Creek and Rozelle Bay adequately and does not disclose any water quality management measures
- Concern that no geotechnical tests have been carried out in the Lilyfield area (previously a quarry site in the 19th century), tests were carried out in some areas but not all. Further concerned that future geotechnical tests are left to the decision of contractors by the EIS
- Concern that surface and ground water details in the EIS are not adequate in determining what is the necessary design of the treatment plant to satisfy section 120 of the *Protection of the Environment Operations Act 1997* (NSW) (POEO Act)
- Concern the EIS does not provide specific discharge or performance criteria and hence unable to determine if the proposed system is appropriate
- Concerns regarding the contamination to waterways strategy that the EIS has in place for Darley Road which involves ‘treated’ water being discharged into stormwater. They believe this would not only impact the waterways but also the area for recreational activities affecting amenity and possibly health.

Response

The assessment of potential soil and water quality impacts was undertaken in accordance with the Secretary’s Environmental Assessment Requirements (SEARs) issued by the Secretary of the NSW Department of Planning and the Environment (DP&E) and associated performance measures related to soil and water quality for the project, as well as relevant legislation and government policies and guidelines.

The surface water assessment comprised both a desktop assessment which involved a review of the existing surface water environment across the study area and a field assessment which comprised a baseline surface water monitoring program. The baseline surface water monitoring program was used to establish existing surface water quality conditions and to provide a baseline for assessment of water quality during and after construction of the project.

The assessment of potential impacts of the project on soils and groundwater included a review of the geological context, soil landscapes, and acid sulfate soils within the project footprint. It also included a review of the geotechnical investigations carried out for the project. A combined hydrogeological and geotechnical field investigation was undertaken which included the excavation of over 200 geotechnical boreholes to identify the geology, and the construction of 58 monitoring wells (refer to Chapter 19 (Groundwater) of the EIS). During the drilling program, samples were collected and submitted to a laboratory for analysis.

The ground conditions at the proposed Rozelle interchange (located at Lilyfield and Rozelle) have been assessed and are predominately good quality Hawkesbury Sandstone beneath the residential area of Rozelle. The geology beneath the adjacent Rozelle Rail Yards is complex as it is underlain by a deep palaeochannel sequence that is composed of saturated sand, silts and clay. Several basalt dykes trending to the north-west have been mapped cross-cutting the sandstone and outcropping in the sandstone cutting north of the Rozelle Rail Yards. These features have been considered and the horizontal and vertical tunnel alignments of the tunnels have responded to the geological conditions. Several previous investigations have been carried out at the Rozelle Rail Yards at Lilyfield and Rozelle, including fill, natural soil and groundwater samples collected as part of a site investigation undertaken in 2016 to identify potential contamination in the area.

The assessment of water quality in the EIS was informed by Model for Urban Stormwater Improvement Conceptualisation (MUSIC) modelling to assess the performance of the operational water quality treatment measures against pollutant reduction targets. It also allowed for a qualitative assessment of the risk posed by discharged treated water from the mainline tunnels to ambient water quality in Rozelle Bay and Hawthorne Canal.

Potential construction and operation impacts of the project on water quality are discussed in sections 15.3.2 and 15.4.2 of the EIS. This includes the production of wastewater from tunnelling works, mobilisation of pollutants, spills or leaks of fuels and/or oils and increased stormwater runoff. The indicative discharge points to be used during construction for construction wastewater were identified for each construction ancillary facility. Wastewater will either be reused onsite, transported to a liquid waste facility or discharged to the existing stormwater system after being treated. Discharge points connect to waterways including Dobroyd Canal (also known as Iron Cove Creek), Hawthorne Canal and Whites Creek, which ultimately discharge into Iron Cove and Rozelle Bay. Potential impacts to Iron Cove Creek (Dobroyd Canal) are assessed in section 6.3, section 7.2 and section 8.1.2 of Appendix Q (Technical working paper: Surface water and flooding) of the EIS.

The EIS recognised that during operation, there is potential for surface water quality to be impacted due to spills and leaks of fuels and/or oils and mobilisation of contaminated sediments. The MUSIC modelling assessed the performance of the proposed water quality treatment measures against pollutant reduction targets. Stormwater runoff from the project would be controlled by a stormwater quality treatment system, designed in accordance Sydney Harbour and Parramatta River catchment water quality objectives (Department of Environment, Climate Change and Water (DECCW) 2006).

The tunnels would include drainage infrastructure to capture groundwater and stormwater ingress, spills, maintenance wastewater, fire suppressant deluge and other potential water sources. Two tunnel drainage streams, one to collect groundwater inflows and the other to capture tunnel wastewater, are expected to produce flows containing a variety of pollutants that require slightly different discharge and disposal options. Collected groundwater would be pumped to water treatment facilities for treatment prior to discharge to receiving waterways. Other sources of water captured by the tunnel drainage system (ie washdown or a spill) would be collected in tunnel sumps, assessed to determine the source, tested, and either pumped to the surface for treatment prior to discharge or disposal (if treatment is not appropriate), or removed directly from the sump by tanker for treatment and disposal elsewhere.

Tunnel wastewater from the mainline tunnels during operation would be pumped to a water treatment facility at the Darley Road motorway operations complex (MOC1) at Leichhardt and treated water would either be discharged into Hawthorne Canal, or disposed directly into the sewer system in accordance with a Trade Waste Agreement with Sydney Water. The preferred option will be confirmed during detailed design (refer to section 19.4.4 of the EIS). Tunnel drainage for the Rozelle interchange and the Iron Cove Link tunnels would be pumped to a water treatment plant at the Rozelle East motorway operations complex (MOC3), with treated flows discharged to a constructed wetland within the Rozelle Rail Yards. This would provide some 'polishing' of the effluent, helping to remove residual dissolved constituents such as nitrogen and phosphorus not removed by the water treatment plant. Treated flows would ultimately flow to Rozelle Bay, via the northern drainage channel and the culvert to be installed below City West Link (refer to sections 15.4.2 of the EIS).

Water quality monitoring would be implemented to monitor impacts on ambient water quality within the receiving waterways. With consideration of groundwater quality, proposed treatment and receiving water quality, residual impacts associated with treated tunnel water discharges to ambient water quality are likely to be negligible.

Consideration of high rainfall events and impacts associated with flooding and excess discharges were assessed in section 17.3 and 17.4 of the EIS (see **Chapter C17** (Flooding and drainage) for further responses to flooding and drainage submissions).

Temporary construction water treatment plants and operational water treatment facilities will be designed and managed so that treated water would be of suitable quality for discharge to the receiving environment. Discharge criteria would be developed in accordance with ANZECC (2000) and with consideration of the relevant NSW Water Quality Objectives (WQOs) and POEO Act. For construction, an ANZECC (2000) species protection level of 90 per cent is considered appropriate for adoption as discharge criteria for toxicants where practical and feasible. The discharge criteria for the treatment facilities will be included in a Construction Soil and Water Management Plan (CSWMP).

For operation, the ANZECC (2000) 'marine' default trigger values for 95 per cent level of species protection are considered an appropriate protection level for the recovery waterways. Discharge criteria has been set for iron (0.3 milligrams per litre) and manganese (1.9 milligrams per litre) and further criteria for the treatment facilities will be included in an Operation Environmental Management Plan (OEMP). Discharge criteria for operation will be developed during detailed design in consultation with relevant stakeholders (such as the NSW EPA, NSW Department of Primary Industry – Water and the relevant local councils). Therefore, discharge criteria has been considered in the EIS in order to assess likely impacts. The final discharge criteria will, however, be developed during detailed design.

Opportunities to incorporate other forms of nutrient treatment within the plant at Darley Road will be investigated during detailed design.

A CSWMP will be prepared for the project. During construction, soil erosion would be managed in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom 2004) and *Managing Urban Stormwater: Soils and Construction Volume 2* (NSW Department of Environment and Climate Change 2008a), commonly referred to as the 'Blue Book'. The number, location and size of sediment basins would be confirmed during detailed design. The Blue Book recommends that where receiving waters are sensitive, sediment basins should be sized for an 80th percentile or 85th percentile five-day rainfall depth for disturbance periods of less than or greater than six months respectively. Discharges from any sediment basins installed during construction would be regulated by the NSW EPA through the project's Environment Protection Licence (EPL).

Erosion and Sediment Control Plans (ESCPs) will be prepared for all work sites in accordance with the Blue Book. ESCPs will be implemented progressively with site disturbance and will be updated as required as the work progresses and the sites change. The extent of ground disturbance and exposed soil will be minimised to the greatest extent practicable to minimise the potential for erosion. See **Chapter E1** (Environmental management measures) for further information regarding the management of potential soil and water quality impacts. Measures to manage water levels in sediment basins to minimise the potential for overtopping during high rainfall events would be considered for inclusion in the CSWMP.

C15.2 Soil impacts during construction

Eight submitters raised concerns about the soil impacts during construction. Refer to section 15.3 of the EIS, Appendix Q (Technical working paper: Surface water and flooding) of the EIS and Appendix R (Contamination) of the EIS for details of potential soil impacts during construction.

C15.2.1 Soil impacts from construction

Submitters raised concerns regarding soil impacts during construction. Specific issues included:

- General concern about the impact of excavation and construction on soil, specifically at the Rozelle interchange
- Concern that toxic pollutants may be leached from the project to soil. Excavation associated with the project construction might also contaminate soil
- Construction at St Peters could have a negative impact on soil quality
- Disturbance of actual or potential acid sulfate soils at the western end of the Darley Road civil site could impact local soil quality
- Concern that the identified high contamination risk at the proposed civil and tunnel sites at Rozelle and Annandale could impact on local soil quality.

Response

The potential impacts on soil during the construction phase would be from erosion of exposed soils and contamination from project activities. The construction of the project would also have the potential to mobilise soil and groundwater contamination. These risks are present during surface works at all construction ancillary facilities, including the Campbell Road civil and tunnel site (C10) at St Peters, and would be managed through implementation of standard construction site mitigation measures including stabilising disturbed ground and exposed soils, stormwater management to reduce erosion, dust suppression and appropriate storage with secure bunding for chemicals and fuels.

There is a risk that any erosion and/or runoff within the Rozelle Rail Yards could be contaminated. To avoid and minimise these potential impacts, a soil conservation consultant would be engaged to provide input during construction, to ensure that stormwater within the Rozelle Rail Yards is appropriately managed to prevent contamination impacts.

Potentially contaminated areas directly affected by the project will be investigated and managed in accordance with the requirements of guidance endorsed under section 105 of the *Contaminated Land Management Act 1997* (NSW) (CLM Act). This includes further investigations in areas of potential contamination identified in the project footprint. If contamination posing a risk to human or ecological receptors is identified, a Remediation Action Plan (RAP) will be prepared (see environmental management measure in CM01 in **Chapter E1** (Environmental management measures)).

Areas of the Rozelle civil and tunnel site (C5) at Rozelle and The Crescent civil site (C6) at Annandale have been identified in the EIS as likely to contain acid sulfate soils and as having a high risk for contamination. Further soil testing in areas identified as a high risk of containing acid sulfate soils will be carried out prior to construction. The Darley Road civil and tunnel site (C4) was not identified as an area of high risk. Procedures, prepared in accordance with the requirements of the *Acid Sulfate Soil Manual* (Acid Sulfate Soil Management Advisory Committee 1998), will be included in a CSWMP and implemented in the event that acid sulfate soils are encountered during construction of the project. Therefore, impacts on local soil quality as a result of acid sulfate soils are not expected.

Leaching of contaminants as a result the project could occur from accidental spills and leaks from the use of plant and machinery at the construction ancillary facilities. Management measures to avoid soil contamination from construction activities at all construction ancillary sites include:

- The development and implementation of a CSWMP including procedures to manage potentially contaminated stormwater runoff (see environmental management measure SW01 and CM07 in **Chapter E1** (Environmental management measures))
- Appropriately storing contaminated materials and materials with the potential to cause contamination to reduce the potential for environmental contamination due to spills and leaks (see environmental management measure CM08)

- Storage of dangerous goods and hazardous materials will occur in accordance with suppliers' instructions and relevant Australian Standards and legislation including the:
  - *Work Health and Safety Act 2011* (NSW)
  - Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW 2005)
  - Environment Protection Manual for Authorised Officers: Bunding and Spill Management, technical bulletin (NSW EPA 1997).

  Storage methods may include bulk storage tanks, chemical storage cabinets/containers or impervious bunds (see environmental management measure HR1)
- Secure, bunded areas will be provided around storage areas for oils, fuels and other hazardous liquids. Impervious bunds will be of sufficient capacity to contain at least 110 per cent of the volume of the largest stored container (see environmental management measure HR2)
- Management measures to reduce the potential for spills, reduce potential spill volumes and prevent any contamination will be developed and implemented for activities such as vehicle refuelling, servicing, maintenance, washdown, where there is a potential for spills and contamination (see environmental management measure HR3).

See **Chapter E1** (Environmental management measures) for these and other environmental management measures.

C15.3 Water quality and discharge impacts during construction

397 submitters raised concerns about water quality and discharge impacts during construction. Refer to section 15.3 of the EIS, Appendix Q (Technical working paper: Surface water and flooding) of the EIS and Appendix R (Contamination) of the EIS for further details of potential water quality impacts during construction.

C15.3.1 Water quality impact due to construction activities

Submitters have raised concerns regarding potential water quality impacts from construction of the project, including:

- Concern about the risk of waterway contamination from the construction of the Iron Cove Link tunnel, which is near Iron Cove Bridge
- Concern about the impact of excavation and construction on waterways
- Concern about contaminated water being discharged into Rozelle Bay and Alexandra Canal
- Construction of the mainline M4-M5 Link tunnel and construction sites at Camperdown and The Crescent will adversely impact on water quality of local waterways and Rozelle Bay
- Construction at St Peters could have negative impacts on water quality
- Concern about the water contamination risk as a result of construction activities at the Pyrmont Bridge Road tunnel site (C9)
- Disturbance of actual or potential acid sulfate soils at the western end of the Darley Road civil site could impact local water quality
- Concerns that construction will pollute water in the harbour
- Construction will impact various projects which focus on the naturalisation of Whites Creek, Johnstons Creek and Iron Cove Creek
- Concern with the reuse of contaminated water for dust suppression and wheel washing without any environmental assessment to assess potential impacts
- Concern about the impacts of discharging treated water into the waterways near recreational facilities like the rowing clubs in Leichhardt. Concern with the discharge of polluted water during construction into the environment in regards to:
  - Different treatment systems given in the EIS do not reflect the terms of section 120 of the POEO Act that the proponent, as the polluter, must pay and treat polluted water

- The groundwater treatment objectives have no resemblance to the requirements of the POEO Act.

Response

The potential impacts on surface water quality during the construction phase would be from erosion of exposed soils and associated sedimentation in waterways, contaminated stormwater runoff and discharge of poorly treated groundwater. Exposure of potential acid sulfate soils may result in generation of sulfuric acid and subsequent acidification of waterways and mobilisation of heavy metals into the environment, if poorly managed. Potential impacts on receiving waterways have been considered, including the Sydney Harbour, Rozelle Bay, Iron Cove and Alexandra Canal.

These potential impacts will be managed through implementation of a CSWMP which will include standard construction site mitigation measures such as stabilising disturbed ground and exposed soils, installation of sediment traps and basins, stormwater controls, dust suppression, implementing secure bunding for storage of chemicals and fuels and monitoring and managing surface water quality. Erosion and Sediment Control Plans will also be prepared and implemented for all work sites (see **Chapter E1** (Environmental management measures)). These measures will be implemented in order to protect nearby waterways at all construction ancillary facilities where surface works would be carried out. Discharges from the project during construction will be regulated by the NSW EPA through the project's EPL.

During construction, the construction water and groundwater collected in the tunnel would be tested and treated at temporary construction water treatment facilities prior to reuse or discharge. The type, arrangement and performance of construction water treatment facilities would be further refined during detailed design. Temporary construction water treatment plants will be designed and managed so that treated water would be of suitable quality for discharge to the receiving environment. An ANZECC (2000) species protection level of 90 per cent is considered appropriate for adoption as discharge criteria for toxicants where feasible and reasonable. The discharge criteria for the treatment facilities will be included in the CSWMP. The proponent will be responsible for ensuring controls are implemented so that the project would not significantly impact on water quality during construction consistent with the requirements of section 120 of the POEO Act and therefore would not adversely impact the water quality of local waterways, including near recreational facilities such as rowing clubs.

Mapped acid sulfate soils at and around the Darley Road civil and tunnel site (C4) are shown in Figure 4-14 of Appendix R (Technical working paper: Contamination) of the EIS. Land at the site is mapped as Soil Class 5 (No known occurrence of acid sulfate soils) and land located to the west is mapped as Soil Class 2. The Darley Road civil and tunnel site (C4) was not identified as an area of high risk of acid sulfate soils. Procedures, prepared in accordance with the requirements of the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee 1998), will be included in a CSWMP and implemented in the event that acid sulfate soils are encountered during construction of the project. Therefore, impacts on local water quality as a result of acid sulfate soils are not expected. See **section C15.2.1** for measures to manage acid sulfate soils. A program to monitor potential surface water quality impacts during construction will also be developed and would commence prior to ground disturbance (see SW02 in **Chapter E1** (Environmental management measures)).

The project includes some waterway naturalisation works, such as the reshaping and naturalisation of a section of Whites Creek from The Crescent back to Railway Parade. Sydney Water is currently investigating potential opportunities for naturalisation within sections of Johnstons Creek and Whites Creek at Annandale and Iron Cove Creek at Haberfield. A concept design has been developed for the Whites Creek naturalisation project which includes the replacement of deteriorating concrete banks and low flow channel with a combination of rocks, native plants and sandstone blocks or concrete. Treated water from construction sites at Haberfield/Ashfield and Annandale would be discharged to Dobroyd Canal (Iron Cove Creek) and Johnstons Creek, however the project is not proposing any physical works which would directly impact on the naturalisation works proposed for these two creeks. These projects are discussed further in section **C15.6.1**. The project is proposing to upgrade a section of Whites Creek between the Inner West Light Rail corridor and Rozelle Bay (refer to section 5.9.2 of the EIS).

The Sydney Water naturalisation works at Whites Creek would be located adjacent to Railway Parade and Hutchinson Street to the south of the Rozelle interchange, and are scheduled for construction in the 2017 financial year.

The design of the project naturalisation works on Whites Creek would be finalised during detailed design but are likely to adopt a similar philosophy regarding surface treatments to integrate with Sydney Water's naturalisation works. Sydney Water would be consulted during the development of the detailed design in relation to the timing of the works and the compatibility of the proposed design.

C15.3.2 Water quality impact due to construction activities at Rozelle ancillary facilities and the Rozelle Rail Yards

Submitters raised concerns about impacts of contaminated soil at the Rozelle Rail Yards on water quality. Specific concerns included:

- Construction of the Rozelle interchange will impact the nearby waterways in this area. Construction can cause disturbance of toxic industrial pollutants at Rozelle which can spread into waterways
- The Rozelle Rail Yards is of great concern as the site is highly contaminated and the construction work that will be carried out will cause disturbance of contaminated soils that will impact nearby waterways, particularly Easton Park drain, Whites Creek and Rozelle Bay. Acid sulfate soils have been identified and could impact local water quality
- Contamination risk for nearby waterways from vehicles transporting spoil on adjacent roads and through stormwater
- Concern that there is a risk of leakage/spills of hydrocarbons and other chemicals from machinery into waterways
- Water from plant washing, concrete slurries and tunnelling activity will introduce contaminants to waterways
- Water from tunnelling activity and other works will introduce contaminants to nearby waterways
- Concern that the identified high contamination risk at the proposed civil and tunnel sites at Rozelle and Annandale could impact on local water quality.

Response

Extensive soil and groundwater investigations have been carried out at the Rozelle Rail Yards and the contamination in the area has been well considered (refer to Chapter 16 (Contamination) of the EIS). Contaminated areas will be managed in accordance with the requirements of guidance endorsed under Section 105 of the *Contaminated Land Management Act 1997* (NSW) and in potentially contaminated areas such as the Rozelle Rail Yards, further investigations will be carried out and if contamination posing a risk to human or ecological receptors is identified, a RAP will be prepared. The RAP will be prepared having regard to the proposed future land use which at the Rozelle Rail Yards which is open space. A CSWMP will also be prepared for the project including procedures to manage potentially contaminated soils and stormwater runoff and acid sulfate soils (see **Chapter E1** (Environmental management measures)).

NSW Roads and Maritime Services (Roads and Maritime) is carrying out a suite of site management works on part of the Rozelle Rail Yards, which will be undertaken prior to the commencement of the M4-M5 Link project. The project would remove rail and rail related infrastructure from the site and allow existing issues such as waste and noxious weeds to be appropriately managed. This project has been assessed separately through *The Rozelle Rail Yards – Site Management Works Review of Environmental Factors* (Roads and Maritime 2016). After completion of the works, the 'finished site' would be managed and maintained to ensure that the surface cover and stormwater controls are operating effectively until commencement of the construction of the M4-M5 Link project. The site management works are to be completed during 2018.

Potential water quality impacts during construction of the project are regularly encountered on major construction projects, are well understood and management measures are well developed and consistently applied to minimise impacts. During construction, soil erosion would be managed in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom 2004) and the 'Blue Book'. The number, location and size of sediment basins would be confirmed during detailed design. Temporary construction water treatment plants will be designed and managed so that treated water would be of suitable quality for discharge to the receiving environment (ie Rozelle Bay). These water treatment plants would treat wastewater collected in the tunnels prior to reuse or discharge. An ANZECC (2000) species protection level of 90 per cent is considered appropriate for adoption as discharge criteria for toxicants where practical and feasible. The discharge criteria for the treatment

facilities will be included in the CSWMP. Discharges from any sediment basins installed during construction would be regulated by the NSW EPA through the project's EPL.

Areas of the Rozelle civil and tunnel site (C5) at Rozelle and The Crescent civil site (C6) at Annandale have been identified in the EIS as likely to contain acid sulfate soils and as having a high risk for contamination. Further soil testing in areas identified as a high risk of containing acid sulfate soils will be carried out prior to construction. A Construction Soil and Water Management Plan will be prepared for the project including procedures to minimise the interaction of stormwater with contaminated land, including acid sulfate soils, and manage potentially contaminated stormwater runoff, as described in Chapter 15 (Soil and water quality) of the EIS.

Management measures will be implemented to avoid impacts from spills and leaks including appropriate storage and transport of contaminated and hazardous materials and procedures for vehicle refuelling, servicing, maintenance and washdown (refer to Chapter 25 (Hazard and risk) of the EIS).

Chapter 23 (Resource use and waste minimisation) of the EIS discusses spoil management for the project. Contaminated material would be segregated from uncontaminated material on site to prevent cross-contamination during the storage and handling of spoil. A Construction Waste Management Plan will be prepared for the project, which will include procedures for handling, storing and transporting potentially contaminated substances (see **Chapter E1** (Environmental management measures)). Spoil would be classified in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste* (NSW EPA 2014), and depending on the extent of the contamination, disposed of lawfully at an appropriately licensed facility.

Environmental management measures for the project to manage potential impacts associated with the transportation of spoil include:

- All loaded spoil haulage trucks and other project-related heavy vehicles carrying materials with the potential to result in dust generation will be covered to prevent dust emissions during transport in accordance with relevant road regulations (see environmental management measure AQ15 in **Chapter E1** (Environmental management measures))
- All sealed surfaces within sites and site accesses will be managed to reduce dust generation and sediment tracking onto roads (see environmental management measure AQ24 in **Chapter E1** (Environmental management measures))
- At the commencement of establishment of project ancillary facilities, controls such as wheel washing systems and rumble grids will be installed at all site exits to prevent deposition of loose material on sealed surfaces outside project sites to reduce potential dust generation (see environmental management measure AQ25 in **Chapter E1** (Environmental management measures)).

C15.4 Soil impacts during operation

Two submitters raised concerns about soil impacts during operation of the project. Refer to section 15.4 of the EIS for further details of potential soil impacts during operation of the project.

C15.4.1 Contamination of soils

Submitters raised concerns that toxic pollutants may be leached from the project to local soils.

Response

Minimal substances are required during operation that have the potential to result in contamination. Surfaces would be sealed and stormwater runoff from the project would be controlled by a stormwater quality treatment system. Therefore, there would be limited pathways for potentially contaminated substances to reach soils during operation.

C15.5 Water quality, treatment and discharge impacts during operation

614 submitters raised concerns about water quality, treatment and discharge during operation. Refer to section 15.4 of the EIS and Appendix Q (Technical working paper: Surface water and flooding) of the EIS for further details of water quality impacts during operation.

C15.5.1 General water quality, treatment and discharge impacts during operation

Submitters raised concerns about water quality during operation. Specific concerns included:

- Concern about contaminated water being discharged into Rozelle Bay and Alexandra Canal
- Concern regarding the contamination of waterways with increased road runoff
- Concern with the discharge of polluted water into the environment during operation in regards to:
  - Different treatment systems given in the EIS do not reflect the terms of section 120 of the POEO Act that the proponent, as the polluter, must pay and treat polluted water
  - The groundwater treatment objectives have no resemblance to the requirements of the POEO Act
- Concern about overland flow and stormwater runoff that could affect water quality of Easton Park drain, Whites Creek and Rozelle Bay. Acid sulfate soils have been identified in the area
- Discharge of contaminated surface water to the stormwater system and ultimately Hawthorne Canal and Iron Cove
- Concern regarding the contamination of waterways from 'treated' water being discharged into stormwater, specifically from the Darley Road facility. Submitter believes this would not only impact the waterways but also the area for recreational activities, affecting amenity and possibly health
- Concern that the wetlands at the Rozelle Rail Yards will contain contaminated water. The EIS states that the wetland will treat and polish phosphorous and nitrogen from the exhaust fumes and the soil beneath it which is already contaminated
- Submitter believes the proposed Eastern Drainage Channel at Rozelle is a sensible piece of infrastructure, but believes it would be beneficial to discharge into White Bay rather than Rozelle Bay as there is a greater exchange of water in White Bay and less sediment would flow into Rozelle Bay.

Response

Potential operational impacts on water quality include:

- Increased stormwater runoff and associated increases in pollutant loading from roads
- Spills or leaks of fuels and/or oils from vehicle accidents or from operational plant and equipment
- Discharges of contaminated tunnel wastewater (eg groundwater ingress, stormwater ingress, tunnel washdown water)
- Erosion of soft landscaped areas during the vegetation establishment period
- Scour/mobilisation of contaminated sediments at potential new outlet locations (ie Rozelle Bay and Iron Cove) and increased flow to existing locations (ie Alexandra Canal).

Rates of generation of pollutants in the stormwater runoff from surface roads were estimated using MUSIC modelling. Stormwater pollutant loads generated by the project would be controlled by a stormwater quality treatment system, designed in accordance with the project stormwater quality objectives developed with consideration of the Sydney Harbour and Parramatta River catchment water quality objectives. MUSIC modelling was undertaken to assess the impact of the project and performance of the stormwater quality treatment measures. The modelling results for the main locations where water would be discharged (Rozelle Bay, Iron Cove, White Bay and Whites Creek) and for the project as a whole indicate that the project would generally reduce the mean annual stormwater pollutant loads being discharged to the five receiving waterways, when compared to the existing conditions.

Wastewater from the tunnels will be treated prior to discharge to receiving waters. Treated flows from the Rozelle plant would drain via a constructed wetland to Rozelle Bay. The operational water treatment facilities would be designed such that effluent would be of suitable quality for discharge to the receiving environment and developed in accordance with ANZECC (2000) and relevant NSW WQOs. The proposed constructed wetland at Rozelle will provide 'polishing' treatment to the treated groundwater flows removing a proportion of the nutrient (forms of nitrogen and phosphorus) and metal load. With consideration of groundwater quality and proposed treatment, the concentration of the key constituents in the treated discharge to Rozelle Bay and Hawthorne Canal are unlikely to result in significant changes in water quality in the receiving waterways. Due to the mixing and dilution affect which would occur at the outlet to the receiving waters, impacts to ambient water quality are likely to be negligible and localised to near the outlet. The assessment in the EIS demonstrates that discharges from the operational water treatment plants are unlikely to result in a material changes in the receiving waters, consistent with the requirements of section 120 of the POEO Act.

The proposed wetland at the Rozelle interchange would be lined to avoid interaction with the underlying soil and groundwater. During construction of this wetland, any existing soil contamination will be managed in accordance with the management measures discussed in Chapter 16 (Contamination) of the EIS so there will be no ongoing contamination impacts.

The stormwater runoff from the catchment that the Eastern Drainage Channel will convey currently discharges to Rozelle Bay. Discharging runoff to White Bay would involve a significant extension of the drain to the east potentially impacting on the proposed open space area and land under the control of the Ports Authority of NSW. Extension of the drain to White Bay may also potentially limit redevelopment opportunities identified in *The Bays Precinct Urban Transformation Plan*.

C15.5.2 Water treatment plant and tunnel discharge at Darley Road motorway operations complex (Leichhardt)

Submitters raised concerns about water discharge from the Darley Road operational facility (substation and water treatment plant) being contaminated. Specific concerns included:

- The permanent substation and water treatment plant proposed at Darley Road may negatively impact the waterways at the point where the Blackmore Park stormwater channel joins the bay
- It is proposed that the 'treated' water from the tunnel will be directly discharged into the stormwater drain at Blackmore Park which would compromise the integrity of the waterway and bay, which is also used for recreational activities
- The discharge from the proposed water treatment plant at the Darley Road site (which potentially contains asbestos contaminated water and the water from the tunnel) directly into the Dobroyd Canal, Hawthorne Canal and waterways, would cause a permanent impact.

Response

The proposed water treatment plant at the Darley Road motorway operations complex (MOC1) would treat groundwater collected within the project tunnels prior to discharge. Tunnel drainage infrastructure would be designed to accommodate a combination of water ingress events including groundwater ingress, stormwater ingress at portals, tunnel washdown water, fire suppressant deluge or fire main rupture and spillage of flammable and other hazardous materials. During operation, tunnel drainage would be pumped via rising mains to the water treatment plant.

The proposed water treatment plant at the Darley Road motorway operations complex (MOC1) would not be discharged to Dobroyd Canal (Iron Cove Creek). The treated water would be discharged into either Hawthorne Canal or into the sewer system. Water collected within the tunnels not suitable for treatment would be discharged to the local sewer system or disposed of at an appropriate licensed waste facility. This will be confirmed during the detailed design stage.

The operational water treatment facilities will be designed such that effluent will be of suitable quality for discharge to the receiving environment. Due to the mixing and dilution affect which would occur at the outlet to the receiving waters, impacts to ambient water quality are likely to be negligible and localised to near the outlet. Discharge criteria will be developed in accordance with ANZECC (2000), with consideration of the species protection levels for slightly to moderately disturbed marine waters and relevant NSW WQOs and will be included in the OEMP prepared for the project (see environmental management measure OSW16 in **Chapter E1** (Environmental management measures)). Consultation on the final discharge criteria will be undertaken with relevant stakeholders.

C15.5.3 Bioretention at King George Park

A submitter raised concerns about the proposed bioretention facility at King George Park regarding whether this facility is to be permanent and if the water being pumped from the facility into Iron Cove will be filtered.

Response

The bioretention facility will treat stormwater runoff from a portion of Iron Cove Link including a portion of Victoria Road northbound and southbound, and the new portals. It will mimic natural processes by filtering stormwater runoff through vegetation and soils to remove pollutants. Therefore, water runoff from the Iron Cove Link will be treated prior to entering Iron Cove. This is proposed to be a permanent facility.

It is proposed to relocate the bioretention facility to the north of the location presented in the EIS, to an area adjacent to Victoria Road at the eastern abutment of Iron Cove Bridge and within King George Park (see **Chapter D3** (Relocation of the bioretention facility at Rozelle) for further information).

C15.6 Cumulative soil and water quality impacts

Two submitters raised concerns about cumulative soil and water quality impacts of the project. Refer to section 26.4 of the EIS for an assessment of cumulative soil and water quality impacts.

C15.6.1 General cumulative soil and water impacts

Submitters raised concerns regarding:

- The cumulative impacts of WestConnex on soil contamination and negative effects on gardening and growing vegetables
- Table 1-2 of Appendix C of the EIS. This includes that the Iron Cove Link naturalisation works were not included in the cumulative impact assessment in the EIS. The submitter also requests that the project not impact on the Johnston's Creek and Iron Cove Link naturalisation works.

Response

Cumulative contamination impacts are discussed in Chapter 7 of Appendix R (Technical working paper: Contamination) of the EIS. With consideration of the management measures proposed to be implemented as part of the M4-M5 Link project (see **Chapter E1** (Environmental management measures)), there are minimal adverse cumulative contamination impacts anticipated to occur as part of the construction or operation of the project.

The construction and operation of the WestConnex program of works is not anticipated to create additional soil or groundwater contamination to that already identified within the project footprint as a result of historical land use activities. Additionally, the appropriate management of contamination and waste materials disturbed during the construction phase of the respective projects would likely result in an overall improvement in the condition of the land in relation to contamination at project completion compared with identified contamination conditions at the time of acquisition. Therefore, it is not considered that the WestConnex projects will have negative effects on gardening and growing vegetables due to soil contamination.

As described in section 7.2.4 of Appendix R (Technical working paper: Contamination) of the EIS, the cumulative disturbance and management of contaminated soil, fill, sediment, surface water and groundwater as a result of construction and operational activities are unlikely to have a more significant impact on ecological and human health receptors or sensitive environments than they would if undertaken as discrete projects, provided the proposed management and mitigation measures documented in the respective EISs are implemented, maintained and monitored.

The Johnstons Creek naturalisation works do not interact directly with the M4-M5 project footprint. The naturalisation works were considered but not assessed in the cumulative impact assessment as the design was in the early stages and there was insufficient public information available.

The Sydney Water Iron Cove Creek (Dobroyd Canal) naturalisation works would extend between Ramsay Road and Waratah Street at Haberfield. The project does not interact directly with the Iron Cove Creek naturalisation works which are located approximately 150 metres from the mainline tunnel connection with the Wattle Street interchange (which is currently being constructed as part of the M4 East project). The naturalisation works were not identified in the cumulative impact assessment as the works had not been identified in discussions with Sydney Water during the course of the EIS.

C15.7 Soil and water quality environmental management measures

347 submitters raised concerns about the environmental management measures for soil and water quality impacts. The environmental management measures are summarised in **Chapter E1** (Environmental management measures).

C15.7.1 Soil and water quality environmental management measures

Submitters questioned what level of pollution controls will be undertaken to ensure that contaminated water and chemicals are not released into Whites Creek, Rozelle Bay and Alexandra Canal and what management procedures would be made publically available regarding management of soils and waterways. Submitters don't believe that Sydney Motorway Corporation can be trusted to mitigate these risks.

Additional concerns and requests regarding mitigation measures for soil and water quality impacts included:

- Mitigation measures need to be specific, not general
- The approach to develop pollution controls for surface water and groundwater pollution in the future, is unacceptable
- With no specific discharge criteria nominated, the likelihood the treatment plants will deliver the necessary standard of treatment is speculative. In addition, the suggestion of using wetland reeds at Rozelle is unacceptable as the performance of reeds is very limited
- Submitters were concerned with the treatment of discharge water because past history has shown the St Peters leachate treatment plant was not designed with sufficient capacity
- Submitters are concerned there will be no sediment and pollutant management controls at Iron Cove Creek
- Measures to ensure that benzene and other aromatic dangerous compounds are not discharged to the constructed wetland within the Rozelle Rail Yards, from the Rozelle East motorway operations complex (MOC3), are not specified within the EIS. Submitters were also concerned there will be no mitigation measures against the potential for low-level contamination to build up over time
- Provision of water sensitive urban design at redevelopment sites like the Rozelle Rail Yards recreation area should be a priority, to help manage and mitigate stormwater pollution into Blackwattle Bay
- Submitter suggests that environmental management measures for the tunnel drainage treatment for the Rozelle and Iron Cove Link tunnels should include measures to ensure dangerous compounds are not discharged into wetlands. Submitter further suggests that these measures will reduce the cumulative impacts of low level contamination as it will not build up over time

- Concerns were raised regarding the absent detail on measures to ensure that waterways are not polluted during construction, particularly when handling contaminated soils.

Response

The EIS identifies several management measures to minimise risks to receiving waterways and soils, which will be implemented throughout the project footprint, including:

- A CSWMP will be prepared for the project. The plan will include the measures that will be implemented to manage and monitor potential surface water quality impacts and acid sulfate soils during construction. The CSWMP will be developed in accordance with the principles and requirements in *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom 2004) and Volume 2D (DECCW 2008), commonly referred to as the 'Blue Book' (see environmental management measure SW01 in **Chapter E1** (Environmental management measures))
- A program to monitor potential surface water quality impacts due to the project will be developed and included in the CSWMP. The program will include the water quality monitoring parameters and the monitoring locations identified in Annexure E of Appendix Q (Technical working paper: Surface water and flooding) of the EIS where appropriate. The monitoring program will commence prior to any ground disturbance to establish appropriate baseline conditions and continue for the duration of construction and until the affected waterways are rehabilitated to an acceptable condition as certified by a suitably qualified and experienced independent expert (or as otherwise required by any project conditions of approval). Further details to be included in the program are outlined in Appendix Q (Technical working paper: Surface water and flooding) of the EIS (see environmental management measure SW02 in **Chapter E1** (Environmental management measures))
- Erosion and Sediment Control Plans (ESCPs) will be prepared for all work sites in accordance with the Blue Book. ESCPs will be implemented in advance of site disturbance and will be updated as required as the work progresses and the sites change (see environmental management measure SW03 in Chapter E1 (Environmental management measures))
- Temporary construction water treatment plants will be designed and managed so that treated water would be of suitable quality for discharge to the receiving environment. An ANZECC (2000) species protection level of 90 per cent is considered appropriate for adoption as discharge criteria for toxicants where practical and feasible. The discharge criteria for the treatment facilities will be included in the CSWMP (see environmental management measure SW10 in **Chapter E1** (Environmental management measures))
- The operational water treatment facilities will be designed and managed such that effluent will be of suitable quality for discharge to the receiving environment. Opportunities to incorporate nutrient treatment within the plant at Darley Road will be investigated during detailed design. Discharge criteria will be developed in accordance with ANZECC (2000), with consideration of the species protection levels for slightly to moderately disturbed marine waters and relevant NSW WQOs. The discharge criteria for the treatment facilities will be nominated during detailed design in consultation with relevant stakeholders and included in the OEMP (see environmental management measure OSW16 in **Chapter E1** (Environmental management measures))
- Spill containment will be provided on the motorway. Spill management and emergency response procedures will be documented in the OEMP and/or Emergency Response Plan (see environmental management measure OSW14 in **Chapter E1** (Environmental management measures)).

The measures outlined above will be implemented at Dobroyd Canal (Iron Cove Creek) as required.

Two operational water treatment plants will be designed to treat tunnel flows to a suitable quality for discharge to the receiving environment. The operational water treatment plants would be designed to predominantly treat groundwater inflows to the tunnels, but may also treat other tunnel waste water such as stormwater ingress ground portals, tunnel wash down water and fire suppressant deluge water (subject to appropriate water quality testing). Treated flows from the Rozelle water treatment plant will be discharged to a wetland providing additional 'polishing' treatment prior to discharge. Therefore the objective of using the wetland is to provide for additional polishing after treatment at the water treatment plant to remove a proportion of the nutrient (forms of nitrogen and phosphorous) and metal load. Opportunities to incorporate other forms of nutrient treatment within the treatment plant at Darley Road will be investigated during detailed design.

In the highly constrained areas good practice stormwater treatment techniques such as inline pollution control measures would be deployed where feasible and practical. Where space is available, bioretention systems or constructed wetlands would be considered. Where space is not available, other smaller devices, such as proprietary stormwater treatment devices, will be installed. The final design of treatments will be supported by MUSIC modelling and water sensitive urban design principles (see environmental management measure OSW12 in **Chapter E1** (Environmental management measures)). The design of such stormwater quality treatment measures, including their ongoing maintenance, would be undertaken and finalised during detailed design.

These proposed measures to address tunnel water discharges and stormwater discharges will minimise risks of dangerous compounds being discharged into the receiving waterways and mitigate stormwater pollution to receiving waterways, such as Rozelle Bay (which connects to Blackwattle Bay). The CSWMP will also include procedures to manage potentially contaminated stormwater runoff and measures will be implemented to appropriately store dangerous goods and reduce the potential for contamination build up over time due to spills and leaks. Measures to appropriately handle contamination in areas such as Rozelle are further discussed in **Chapter C16** (Contamination) and **Chapter E1** (Environmental management measures). Cumulative impacts are discussed in **section C15.6.1**.

As the EIS is based on a concept design, it is considered appropriate for detailed measures and plans to be developed at the detailed design stage in order to ensure all potential impacts are thoroughly addressed. Should the project be approved, the design and construction contractor(s) will be required to implement the environmental management measures for the project and comply with any conditions of approval that are issued for the project.

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C16 Contamination

This chapter addresses issues raised in community submissions associated with the contamination assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 16 (Contamination) of the EIS for the further detail on the contamination assessment.

Contents

C16.1 Level and quality of contamination assessment

30 submitters raised concerns about the quality of the contamination assessment. Refer to section 16.1 of the EIS and section 3 of Appendix R (Technical working paper: Contamination) for details of the contamination assessment methodology.

C16.1.1 General contamination concern

Submitters had concerns about contamination in the project footprint and how this would be managed. Specific concerns included:

- The level and quality of contamination assessment at O'Dea Reserve was not adequate as the current status of the soil and groundwater quality at this site was not assessed. The EIS states that the site was a former clay pit which was then used for uncontrolled filling but this was not shown in the geological long sections in Appendix E of the EIS. Contaminated groundwater and landfill gas at the site can pose a risk to the workers and environment
- No lead measurements in the soil along Victoria Road between Iron Cove Bridge and Anzac Bridge have been investigated as part of the contamination assessment. The EIS makes no reference to expected or measured lead contaminants from previous vehicle use. The potential health risk of this oversight is large given the disturbance of potentially lead contaminated soil from the construction work planned and the number of children in the area. Submitter wants an independent study to be made into this before approval of the EIS
- The EIS presents an optimistic analysis of potential site contamination and waste management. Failure of action plans is possible as this has happened on preceding WestConnex stages
- Concern the contamination assessment was inadequate in regards to asbestos. No independent testing of toxic materials and/or dust was undertaken by SafeWork NSW
- The EIS identifies contamination risks. Chapter 16 and technical reports show that medium and high risks impact the environment and human health. There are no detailed statements about how these contamination risks will be handled which does not meet the Secretary's Environmental Assessment Requirements (SEARs)
- Submission is concerned that the Proponent’s assessment of potential contamination impacts at the Darley Road civil and tunnel site is defective as it fails to identify the risk to surrounding residents of airborne soil containing contaminants and asbestos from construction activities. There is concern that the assessment is defective because having identified the presence of asbestos on site, it fails to specifically identify the potential for inhalation of asbestos either by workers or residents.

Response

The assessment undertaken in the EIS to address the SEARs for contamination of soils included:

- A review of relevant data and background information including to evaluate whether historical land uses were likely to have caused contamination of soil and groundwater within the study area
- A preliminary assessment of the nature and location of infrastructure, hazardous materials and other features located within the study area, both current and historical
- A review of available published geological and hydrogeological information for the construction ancillary facilities and study area
- Completion of site inspections to assist with the identification of potential on and off-site sources of contamination and to understand the existing condition of the construction ancillary facilities, construction sites and surrounding area
- Assessment of intrusive investigations completed within the project footprint and review of previous reports prepared, to identify the areas and contaminants of concern.

This information has informed the assessment in the EIS and determined the risk of contamination at each of the construction ancillary facilities and along the tunnel alignment. Further investigations will be carried out on the detailed design to inform the preparation of plans containing detailed management measures, prior to construction.

The assessment in the EIS recognises that O'Dea Reserve may contain contaminated soil and groundwater due to the former uncontrolled landfill that was located in the area. O'Dea Reserve is located in Salisbury Lane at Camperdown and is situated above the proposed tunnel alignment at Camperdown. The depth of the tunnel in this location would be around 40 metres below ground level. During tunnel construction, groundwater inflows to the tunnel excavation would require treatment and disposal. The tunnel inflow water would either be:

- Treated on-site and then discharged to stormwater under an Environment Protection Licence (EPL) or to sewer under a Trade Waste Agreement with Sydney Water
- Transported to a liquid waste facility.

During operation, a range of techniques may be used to limit groundwater ingress to the tunnels such as grout injection, pressure cementing and tunnel linings. Groundwater seepage would be required to be extracted from the tunnels, treated and discharged to the receiving water bodies. To manage potential contamination impacts, separate water collection systems would be installed within the tunnel to collect groundwater ingress and other potential water sources. The tunnel water drainage streams from the mainline tunnels would be pumped to a water treatment facility proposed to be located at Darley Road, Leichhardt, with treated flows either discharged to Hawthorne Canal, the existing stormwater pipework or into the sewer system in accordance with a Trade Waste Agreement with Sydney Water. The preferred option would be confirmed during detailed design.

Section 16.3.1 of the EIS identifies the potential impacts at each construction ancillary facility. Potential impacts at the Darley Road civil and tunnel site (C4) are discussed in **section C16.2.3**. Potential impacts on workers include exposure to extracted contaminated groundwater from either direct contact or inhalation of vapours or vapours encountered during tunnelling, which would be managed in accordance with protocols outlined in a site specific Work Health and Safety Plan.

The study area for the contamination assessment is the same as the project footprint, which comprises the location of all operational infrastructure and areas where construction activities would occur. This includes the areas along Victoria Road where the surface works are proposed to occur for the Iron Cove Link at Rozelle and the section of the proposed tunnel alignment from Rozelle to Iron Cove. Lead has been identified as a contaminant of potential concern for areas between Iron Cove Bridge and Anzac Bridge at The Crescent Civil site (C6), Victoria Road civil site (C7) and Iron Cove Link civil site (C8). This was based on an assessment of the previous land uses in the area, previous geotechnical investigations carried out and the analysis of soil samples collected. It is considered that this assessment is adequate to determine the contaminants of potential concern in the study area. Further targeted investigations in areas that have been identified as medium or high risk of contamination presence will be carried out prior to construction. This includes the Rozelle civil and tunnel site (C5), The Crescent civil site (C6) and the Iron Cove Link civil site (C8).

Potentially contaminated areas directly affected by the project will be investigated and managed in accordance with the requirements of guidance endorsed under section 105 of the *Contaminated Land Management Act 1997* (NSW) (CLM Act). If contamination posing a risk to human or ecological receptors is identified, a Remediation Action Plan (RAP) will be prepared. Should no risk be identified during further targeted investigations, the Construction Environment Management Plan (CEMP) prepared for the project will ensure any potential impacts will be managed during construction, including procedures to handle the discovery of previously unidentified contaminated material.

Waste management procedures will be stipulated in the CEMP to manage potential impacts during construction. In addition, a Construction Soil and Water Management Plan (CSWMP) will be prepared and implemented that will include procedures for handling and storing potentially contaminated substances and a Construction Air Quality Management Plan will be developed and implemented to monitor and manage potential air quality impacts (see environmental management measures CM07 and AQ1 in **Chapter E1** (Environmental management measures). Stockpile management procedures will also be implemented to control dust, odour and cross contamination. Furthermore, section 23.3.2 of the EIS discusses how management, transportation and disposal of waste would be based on classification of waste material in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste* (NSW Environment Protection Authority (NSW EPA) 2014). Therefore, any identified contaminants of potential concern will be quantified early in the construction process and appropriate mitigation measures will be implemented, as required.

Asbestos was considered to be present at a number of the construction locations through the assessment of the previous and current land uses. A hazardous materials assessment will be carried out prior to and during the demolition of buildings and that demolition works will be undertaken in accordance with the relevant Australian Standards and relevant NSW WorkCover Codes of Practice, including the Work Health and Safety Regulation 2011 (NSW) (see environmental management measure CM03 in **Chapter E1** (Environmental management measures)). Site specific Asbestos Management Plans will be developed in consultation with relevant stakeholders (government agencies and local councils), where known or suspected asbestos is present, prior to construction. The plans will be prepared to satisfy the SafeWork Australia *Asbestos Codes of Practice and Guidance Notes*, NSW legislative requirements and relevant Australian and New Zealand Standards. The Asbestos Management Plans will include procedures for managing potential dust generation, air monitoring and clearance inspections and reports.

Several management measures are identified in the EIS to manage impacts on the environment and human health. These are discussed further in **section C16.4.3** and are provided in full in **Chapter E1** (Environmental management measures).

C16.2 Impacts occurring on existing contaminated land

661 submitters raised concerns about impacts occurring on existing contaminated land. Refer to section 16.2 of the EIS for existing environment information for various areas within the project footprint.

C16.2.1 Disturbance of contaminated land at the Rozelle construction ancillary facilities and the Rozelle Rail Yards

Submitters had concerns about disturbance and dispersal of contamination at Rozelle. Specific concerns include:

- Construction and tunnelling may spread contaminated dust around the neighbourhood at the Rozelle Rail Yards
- Dust management, emission of toxic gasses and handling of toxic materials during the construction of the project at the Rozelle Rail Yards. Investigation should be made to minimise these impacts before the work proceeds so the community have the opportunity to comment on the methodology
- Given the proximity of the Rozelle Rail Yards to the coal fired power station at White Bay, there is a potential for boiler ash to be present
- Concern that the soil at the Rozelle civil and tunnel site is contaminated and construction on this soil could impact the community at various stages during construction
- Concern that construction work at the Rozelle Rail Yards will disturb the existing contamination, especially as a result of the removal of vegetation, ballast stockpile and excavated soil
- The EIS identified a high risk of contamination issues at the Rozelle civil and tunnel site and The Crescent site at Annandale; however leaves the supply of detailed information to a post -approval stage which is considered to be irresponsible
- There is no provision for the safe removal of toxic substances at the Rozelle Rail Yards (based on previous experiences at St Peters).

A submitter supports the proposed contamination management of the Rozelle Rail Yards.

Response

Existing railway tracks, rail related infrastructure (including rail ballast), surface wastes/stockpiles, noxious weeds and vegetation are being removed from the Rozelle Rail Yards as part of site management works which were assessed separately in the *Rozelle Rail Yards Site Management Works Review of Environmental Factors* (REF) (Roads and Maritime Services 2016). The site management works are not being assessed as part of the EIS and will be completed as a separate project prior to construction of the M4-M5 Link project commencing.

The site management works involve limited excavation other than what is necessary remove the rail ballast across the site to a depth of around 500 millimetres. The site boundary for these works does not extend to include the industrial/commercial properties along the south side of Lilyfield Road which form part of the M4-M5 Link project footprint. The site management works will be undertaken in accordance with the environmental management measures required as part of that approval. More information about the site management works can be found on Roads and Maritime's website.[1]

The extent of contamination in soil and groundwater within the study area at Rozelle has been investigated as part of the EIS. Previous reports for soil and groundwater investigations undertaken at the Rozelle Rail Yards and surrounding areas were reviewed as part of the contamination technical assessment (refer to Appendix R (Technical working paper: Contamination) of the EIS).

As discussed in section 16.3.1 of the EIS, potential contamination impacts from the Rozelle civil and tunnel site (C5) during the construction phase have been assessed as high risk. This was due to contamination being known to be present at concentrations above the relevant assessment criteria, and widespread. Also, exposure pathways to human or ecological receptors are likely to be present now and during or after construction (without implementation of appropriate controls).

Previous investigations at the Rozelle civil and tunnel site (C5) have identified metals (lead, arsenic, cadmium and zinc) and Polycyclic aromatic hydrocarbons (PAHs) in soil exceeding the land use criteria for open space and commercial/industrial. In addition, asbestos was detected in soil and petroleum sourced light non-aqueous phase liquid was detected in groundwater.

The Crescent civil site (C6) during the construction phase has also been assessed as high risk due to contamination being known to be present at concentrations above the relevant assessment criteria and widespread. Also, exposure pathways to human or ecological are receptors likely to be present now and during or post construction (without implementation of appropriate controls).

Previous investigations at the site have identified metals (lead), selected PAHs, per and poly-fluoroalkyl substances (PFAS), selected phthalates, tributyltin and asbestos in soil and/or sediment and/or groundwater. A Site Access and Management Procedure (SAMP) prepared by Jacobs (2015) currently exists for part of The Crescent civil site (C6) – Lot 21 and Lot 22 in Deposited Plan (DP) 1151746.

Potential construction impacts for both sites have been assessed in Chapter 5 of Appendix R (Technical working paper: Contamination) of the EIS.

Several management measures will be implemented at these sites to minimise the impacts presented during construction. These measures are consistent with those to be implemented at other sites, as discussed in **section C16.4.3.**

Construction activities will be managed to minimise impacts from the mobilisation of contaminated soil, sediment, surface water and groundwater (including contaminated vapours) and the generation of dust. It is therefore expected that management measures would be adequate to minimise risks of disturbance of contaminated soil and water impacting on the local community. Further targeted investigations will be carried out prior to construction. If contamination posing a risk to human or ecological receptors is identified, a RAP will be prepared (see environmental management measure CM01 in **Chapter E1** (Environmental management measures)). Therefore, the assessment of potential contamination impacts at Rozelle has been based on detailed information and it is considered that further investigations on the detailed design will dictate management measures that are specific to the site and prevent impacts.

Contaminated groundwater is discussed in Chapter 19 (Groundwater) of the EIS. Previous groundwater investigations have been reviewed and monitoring carried out as part of the groundwater technical assessment (refer to Appendix T (Technical working paper: Groundwater) of the EIS). These investigations identified some areas where contaminated groundwater may occur, including sections of tunnel within the vicinity of the Rozelle Rail Yards. To avoid impacts from altering flow paths, tunnel sections through the alluvium at Rozelle would be constructed as undrained (tanked) and cut-off walls would be installed to reduce the ingress of groundwater from the palaeochannels, minimising potential contaminated groundwater migration. Shallow groundwater is likely to be encountered during ground excavation works and will require management during the construction of the tunnel access decline.

[1] [1] http://www.rms.nsw.gov.au/projects/sydney-inner/rozelle-rail-yard-site-management/index.html

Temporary construction water treatment plants will be designed with consideration of the known and likely contaminants present in the groundwater and managed so that treated water would be of suitable quality for discharge to the receiving environment. The discharge criteria for the treatment facilities will be included in the CSWMP. Groundwater extracted from tunnelling and discharged to stormwater would occur in accordance with an EPL granted by the NSW EPA and a groundwater monitoring program will be prepared and implemented to monitor groundwater quality (see environmental management measures OGW9 and OGW10 in **Chapter E1** (Environmental management measures)).

The former White Bay Power Station is located to the east of the Rozelle civil and tunnel site (C5). As discussed above, further site investigations will be undertaken to investigate identified areas of concern prior to construction. If contamination (including that from boiler ash) posing a risk to human or ecological receptors is identified, a RAP will be prepared.

The design and construction contractor(s) would be required to consult and communicate with stakeholders and the community during construction, including delivering a Community Communication Strategy to distribute information and receive feedback.

The Alexandria Landfill at St Peters interchange is managed as a licensed landfill under the *Protection of the Environment Operations Act 1997* (NSW) and is being remediated in accordance with the requirements of the Landfill Closure Management Plan and in compliance with an EPL. The landfill odours that have been experienced at St Peters are due to the construction works within the licensed landfill. These conditions do not exist at Rozelle and therefore potential odours associated with the disturbance of contaminated soil or groundwater at Rozelle are not considered likely. In the unlikely event that odours did occur they would be managed in accordance with the CSWMP or the Unexpected Discovery of Contaminated Lands Procedure (Roads and Maritime 2013f).

The support for the proposed contamination management at the Rozelle Rail Yards is noted.

C16.2.2 Disturbance of contaminated land at Iron Cove

Submitters had concerns about the disturbance of contaminated land at Iron Cove. Specific concerns include:

- Given the proximity of the Iron Cove Link civil site to the former coal fired power station at Balmain, there is a potential risk of boiler ash dumping in this area
- The disturbance and dispersal during construction of lead, arsenic, cadmium, zinc and other toxic industrial pollutants that are known to be distributed in the soil in the Rozelle area will be spread throughout the surrounding area, including the Rozelle Public School, by the known underground spring at this location, impacting soil and water quality
- Construction work will expose contaminated soil directly adjacent to Victoria Road in the works area from Springside Street to Iron Cove Bridge. This will have significant impact on the community and students.

Response

As discussed in section 16.2.11 of the EIS, the former Balmain Power Station was located directly north and adjacent to the Iron Cove Link civil site (C8). The power station site has been remediated and developed for high density residential and recreational open space land use.

Rozelle Primary School was identified in the assessment as being located around 140 metres topographically up-gradient from the Iron Cove civil site. As discussed in section **C16.2.1**, potential impacts to site workers and the neighbourhood of Rozelle from the mobilisation of contaminated soil and groundwater have been assessed in the EIS. This includes consideration of the surrounding land use, including schools, parks, residential and commercial properties.

The areas and contaminants of concern due to previous land uses identified within the Iron Cove Link civil site (C8) are discussed in section 4.11.7 of Appendix R (Technical working paper: Contamination) the EIS. The site was assessed as a medium contamination risk, with the following potential impacts identified:

- Direct contact, inhalation and ingestion risk to site workers from contaminated soil or hazardous building materials via dust
- Discharge of contaminated surface water to the stormwater system and ultimately Iron Cove

- Disturbance of actual or potential acid sulfate soils at the northeast corner of the site and within the area of the proposed bioretention facility located within King George Park, adjacent to Manning Street at Rozelle (note the revised location of this facility as described in **Chapter D2** (Relocation of the bioretention facility at Rozelle)
- Potential for leaks or spills from equipment and plant used during construction.

Several management measures will be implemented at the Iron Cove Link civil site (C8) to minimise the impacts presented during construction. These measures are consistent with those to be implemented at other sites, as discussed in **section C16.4.3.** Targeted site investigations would be undertaken within the project footprint to investigate identified areas of concern. If contamination (including from boiler ash), posing a risk to human or ecological receptors is identified, a Remediation Action Plan (RAP) will be prepared.

C16.2.3 Disturbance of contaminated land at Leichhardt

Submitters had concerns about the disturbance of contaminated land at Leichhardt. Specific concerns include:

- Concern regarding the impacts on health and property caused from the disturbance of contaminants at the Darley Road civil and tunnel site at Leichhardt. This will pose a risk to the community associated with spoil removal, transfer and handling
- That the Darley Road civil and tunnel site is contaminated by metals, polycyclic aromatic hydrocarbons, total recoverable hydrocarbons, asbestos, lead and volatile organic hydrocarbons (VOCs). The spread of these contaminants to properties and gardens of nearby residents is of major concern
- The assessment risk rating of medium for contamination at the Darley Road civil and tunnel site is of concern considering previous experience with other WestConnex projects
- The risk of health impacts to the local community in the vicinity of the Darley Road civil and tunnel site from the inhalation of asbestos is not stated in the EIS and should be as it is a part of the SEARs
- There is a risk for site workers due to direct contact, inhalation and ingestion of contaminated soil and hazardous building materials via dust
- Concern that disturbance of the contaminated Darley Road civil and tunnel site will impact nearby waterways
- Disturbance of contamination, such as asbestos, during construction of the site and associated discharge of water from the construction water treatment plant.

Response

The EIS recognises that various contaminants of concern may potentially be present at the Darley Road civil and tunnel site (C4) due to former and current land uses. Potential contamination impacts at the Darley Road civil and tunnel site (C4) including to site workers and residents are summarised in Table 16-23 of the EIS through potential contact with contaminants released during demolition and ground disturbance works. This includes the inhalation/ingestion of contaminated dust from demolition of hazardous building materials including asbestos. Potential discharge of contaminated surface water to stormwater and ultimately Hawthorne Canal and Iron Cove has also been assessed as a risk. The site has been assessed as an overall medium contamination risk during construction due to known soil or groundwater concentrations present above the relevant assessment criteria and exposure pathways for human or ecological receptors potentially being present. The risk assessment methodology is discussed in section 3.2.3 of Appendix R (Technical working paper: Contamination) of the EIS.

Several management measures will be implemented at the Darley Road civil and tunnel site (C4) to minimise the impacts presented during construction, including the preparation of site specific management plans. These measures are consistent with those to be implemented at other sites, as discussed in **section C16.4.3**. Furthermore, targeted investigations in areas identified as a medium or high risk of containing contamination will be carried out prior to construction and appropriate management strategies will be developed based on the actual contamination present, including the preparation of a RAP, if required.

Chapter 23 (Resource use and waste minimisation) of the EIS discusses spoil (excavated soil and rock) management for the project. Further soil testing would be required to determine suitable reuse or disposal options for excavated materials. Contaminated material would be segregated from uncontaminated material on site to prevent cross-contamination during the storage and handling of spoil. A Construction Waste Management Plan (CWMP) will be prepared for the project, which will include procedures for handling, storing and transporting potentially contaminated substances (see environmental management measure CM04 in **Chapter E1** (Environmental management measures)). Potential or known contaminated soil would be handled in accordance with the *Protection of the Environment Operations Act 1997* (NSW). Therefore, appropriate management measures will be implemented to avoid impacts on the health of local residents and the spread of any contaminants to local properties, gardens or waterways.

C16.2.4 Disturbance of contaminated land at Haberfield and Ashfield

Submitters had concerns about the disturbance of contaminated land at the Haberfield and Ashfield construction sites, including the Parramatta Road West and East sites due to the historical land use of the sites, including the former use as a car yard. Submitters were concerned that there is a possibility of potentially dangerous contaminants such as asbestos, lead, metals, benzene and pesticides being disturbed during construction and impacting on the nearby community, including schools (such as Haberfield Public School).

Response

The EIS recognises that various contaminants of concern may potentially be present at the Parramatta Road West civil and tunnel site (C1b) and Parramatta Road East civil site (C3b) due to former and current land uses. These sites have been assessed in the EIS as a medium contamination risk due to soil and groundwater contamination potentially present at concentrations above the relevant assessment criteria. Contaminants of potential concern that have been identified in these areas include metals, lead, asbestos, benzene and pesticides.

Potential impacts associated with mobilisation of contaminants through demolition activities have been discussed in section 16.3.1 of the EIS, including inhalation or ingestion exposure risks from demolition of hazardous building materials via dust. Potential construction impacts would be managed by the development and implementation of a CEMP (including sub-plans) and other relevant plans, which would include mitigation measures for the management of contaminated dust and spoil and encountering unexpected contamination. These measures are consistent with those to be implemented at other sites, discussed in **section C16.4.3**.

Further investigations in areas identified as a medium or high risk of containing contamination will be carried out prior to construction and appropriate management strategies will be developed based on the actual contamination present, including the preparation of a RAP, if required. Therefore, all works will be managed to minimise impacts on the local community.

The design and construction contractor(s) would be required to consult and communicate with stakeholders and the community during construction, including preparing and implementing a Community Communication Strategy.

C16.2.5 Disturbance of contaminated land at St Peters

Submitters had concerns about the disturbance of contaminated land at St Peters. Specific concerns include the risk of further contamination and release of landfill gas and leachate that has been identified at the Campbell Road civil and tunnel site (C10).

Response

The EIS recognises that there is known soil and groundwater contamination and potential for landfill gas and leachate at the Campbell Road civil and tunnel site (C10) at St Peters and therefore has assessed the risk of contamination as high. Potential impacts were assessed and the remediation and management of the site is being undertaken as part of the construction of the St Peters interchange for the New M5 project. Ongoing groundwater, leachate and landfill gas monitoring would be undertaken by the New M5 project for the former Alexandria Landfill during the construction and operation of the New M5 project in accordance with the approved Landfill Closure Plan. If required, characterisation of soil and fill materials and preparation of a RAP will be undertaken by the M4-M5 Link design and construction contractor(s) to supplement the existing data and assess the land suitability for the future open space land use.

C16.2.6 Disturbance of contaminated land at Camperdown

Submitters had concerns about the disturbance of contaminated land at Camperdown. Specific concerns include safety breaches at the Pyrmont Bridge Road tunnel site related to asbestos or other hazardous materials emanating from the site affecting the Malt Shovel Brewery's patrons and workers.

Response

The EIS recognises that contaminants are likely to be present at the Pyrmont Bridge Road tunnel site (C9) and it has been identified as a medium contamination risk. Potential contaminants of concern include:

- Asbestos
- Metals (including lead)
- Total Recoverable Hydrocarbons
- Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene
- Polycyclic Aromatic Hydrocarbons
- Volatile Organic Compounds
- Polychlorinated Biphenyls.

Further soil testing would be required to determine suitable reuse or disposal options for excavated materials and any contamination identified will be managed in accordance with the protocols established in the CEMP and associated sub-plans.

Safety risks to the local community will be managed through the implementation of a number of environmental management measures, discussed in **section C16.4.3**. A hazardous materials assessment will be carried out prior to and during the demolition of buildings. Demolition works, including asbestos removal, will be undertaken in accordance with the relevant Australian Standards and relevant NSW WorkCover Codes of Practice, including the Work Health and Safety Regulation 2011 (NSW).

C16.3 Contamination of land due to construction

One submitter raised concerns about contamination of land due to construction. Refer to section 16.3 of the EIS for details of potential contamination impacts during construction.

C16.3.1 Contamination of land due to spills

A submitter had general concerns about spills of toxic water from the project.

Response

Potential contamination impacts on land as a result of the project include accidental leaks and spills from the use of plant and equipment at the construction ancillary sites. As discussed in Chapter 25 (Hazard and risk) of the EIS, management measures to reduce potential spill volumes and prevent any contamination will be developed and implemented for activities such as vehicle refuelling, servicing, maintenance and washdown, where there is a potential for spills and contamination.

The management of contaminated groundwater is discussed in **section C19.3**.

C16.4 Contamination environmental management measures

417 submitters raised concerns about the environmental management measures for contamination impacts. See **Chapter E1** (Environmental management measures) for further details on the contamination environmental management measures.

C16.4.1 Mitigation measures for the Option B construction ancillary facilities

A submitter requested that every measure be taken to limit the possibility of children being exposed to contaminants from the Option B construction ancillary facilities (in particular the Parramatta Road West (C1b) and Parramatta Road East (C3b) sites) such as asbestos, lead, metals, benzene and pesticides. The submitter calls for a ban on any decontamination activity during school hours.

Response

The management measures that would be implemented at the Haberfield/Ashfield construction ancillary facilities to avoid impacts on the local community from contamination are consistent with those that would be implemented at other project sites, as discussed in **section C16.4.3** and in **Chapter E1** (Environmental management measures). Further site investigations will be undertaken and, if required, a RAP will be prepared and implemented to make the land suitable for future land use. Potential construction impacts would be managed through the development and implementation of a CEMP which would include mitigation measures for encountering unexpected contamination and management of dust and spoil. Should the project be approved, the design and construction contractor(s) would be required to implement the management measures outlined in **Chapter E1** (Environmental management measures).

The timing of construction is outlined in Chapter 6 (Construction work) of the EIS. If remediation works are required, these would be carried out during standard construction hours. Hours of construction have been developed based on a balanced consideration of reducing the overall length of the construction program and the need to minimise related impacts. Due to the investigations carried out and strict management of contamination to be implemented during construction to avoid any impacts, it is not considered necessary to limit any site decontamination activities to certain times of the day. Further investigations will be carried out during detailed design, in order to inform the preparation of management plans. The design and construction contractor(s) would be required to consult and communicate with stakeholders and the community during construction, including delivering a Community Communication Strategy to distribute information and receive feedback.

C16.4.2 Mitigation measures for the Rozelle construction ancillary facilities and the Rozelle Rail Yards

Submitters had concerns about the management of contamination at Rozelle. Specific concerns include:

- Rozelle has been an industrial and power generating area for generations and is well known to be contaminated. Concern that a RAP is required for this area
- The EIS does not give satisfactory safeguards or plans on how the contamination at Rozelle will be managed
- How will the contamination management measures at Rozelle be different from the current practices at the Haberfield and St Peters construction site, where there are significant amounts of airborne materials and particles
- Request for details of the protection measures to be implemented to manage the lead pollution levels in soil around the Rozelle area
- Request for plans of routes and timings for movement of contaminated soil and protection measures to mitigate the impacts on residents
- The Rozelle Rail Yards might be contaminated with toxic contaminants such as lead and asbestos and no provision has been made for safe removal of these toxic substances. These measures should be considered
- The Rozelle site is very close to a major waterway and measures should be put in place to make sure the water during construction is not contaminated. The details of how the water will be treated should be provided in the EIS

- The Rozelle Rail Yards are highly contaminated land and currently the EIS gives no specific details on how the contaminated land will be managed
- The EIS provides inadequate detail on how contaminated dust at the Rozelle Rail Yards during construction will be securely managed. It is unacceptable for contamination management to be finalised after construction contracts have been issued and the community will not have an opportunity to comment on the prescribed management measures
- Submitters request the tunnel drainage treatment for the Rozelle interchange and Iron Cove Link tunnels should include environmental management measures to ensure dangerous compounds are not discharged. These measures would reduce the cumulative impact of low level contamination building up over time
- Submitter requests that the Rozelle Rail Yards be handed to the Inner West Council by project contractors in a non-contaminated state that is safe for surrounding communities
- Concern that there is no detail in the EIS about how lead contaminated soil, asbestos, dioxins and other toxins and spoil will be safely removed without airborne particles being emitted during demolition, excavation and construction at Rozelle
- Concern that the removal of buildings at Rozelle would increase winds and this will bring asbestos to homes during remediation and construction at the Rozelle Rail Yards. A full plan of how the site will be remediated and the contaminants removed must be presented to local residents before the remediation begins
- While the environmental management of existing contamination and future potential contamination is considered in the EIS, it is not clear how the potential impacts on the surrounding schools would be identified and managed (mainly concerned with existing soil contamination throughout Rozelle).

Response

The risks to human or ecological receptors associated with known contamination at the Rozelle civil and tunnel site (C5) have been acknowledged in Table 16-23 of the EIS. As this site has been assessed as a high contamination risk, further investigation will be undertaken prior to construction. Based on the investigations, a RAP will be developed, if required. The RAP would be prepared by a suitably qualified and experienced contaminated lands consultant and independently audited by a NSW EPA accredited site auditor. The RAP would consider the intended future use of the land, a large portion of which will be for public open space, and will ensure that the area is left in a state that is safe for surrounding communities.

The management measures that will be implemented for handling of contaminated soil and water are discussed in **section C16.4.3**, including various management and monitoring measures to control the mobilisation of dust, asbestos and other contaminated material. Contaminated material would be segregated from uncontaminated material on site to prevent cross-contamination during the storage and handling of spoil. The treatment of contaminated water to ensure dangerous compounds are not discharged is discussed in section 15.3.2 of the EIS. During construction, temporary water treatment plants would be constructed at each construction ancillary facility where groundwater is extracted during dewatering and tunnelling to mitigate adverse water quality impacts arising from the discharge of untreated construction water. During operation, treated flows from the Rozelle operational treatment facility would drain via a constructed wetland to Rozelle Bay. The operational water treatment facilities would be designed such that effluent would be of suitable quality for discharge to the receiving environment and all potentially contaminated areas directly will be managed in accordance with the requirements of guidance endorsed under section 105 of the CLM Act. See **sections C15.3** and **C15.6** for further information on water treatment.

The mobilisation of contaminants such as asbestos and lead via dust from demolition of hazardous materials will be managed through a hazardous material assessment, and implementation of an Asbestos Management Plan and air quality will be managed and monitored through a Construction Air Quality Management Plan. This is further discussed in **section C16.4.3.**

As discussed in **section C16.2.1**, management measures have been informed by the assessment in the EIS, which includes consideration of the surrounding land use in close proximity to the Rozelle Rail Yards, including schools, parks, residential and commercial properties.

Management of contamination for previously approved WestConnex projects is discussed in **section C16.4.3**. The design and construction contractor(s) would be required to consult and communicate with stakeholders and the community during construction, including developing and implementing a Community Communication Strategy.

C16.4.3 General mitigation measures

Submitters had concerns about the mitigation measures for the management of contamination. Specific concerns include:

- Objection to the NSW EPA granting a licence for this project on the basis that there were no clear plans on how contamination would be controlled
- Based on experiences at St Peters and Haberfield, the project would not manage contamination impacts (including asbestos) appropriately in all contaminated areas and specifically at Rozelle Bay and Alexandra Canal. More detailed mitigation measures are required before proceeding with the M4-M5 Link
- Concern with the management of dust, emission of toxic gasses and handling of toxic materials during the construction of preceding WestConnex projects, suggesting an investigation to mitigate these concerns
- According to the previous experience at St Peters and contractor failure in handling contamination, explicit measures should be put in place for any contamination issue. Collected samples and analytical results should be published within 24 hours of sample collection and sample analysis
- Concern with the use of open storage of contaminated wastes, including asbestos and acid sulfate soils. Submitter believes it would be more appropriate to store contaminated wastes in storage sheds until off-site disposal was arranged
- Measures should be put in place to make sure the water during construction is not contaminated where it might be in contact with contaminated soils
- The contamination mitigation will be managed by an unknown contractor
- Concern regarding the failure to comply with NSW EPA licence due to the SMC's mismanagement of contamination during preceding WestConnex stages. This impacted St Peters residents who now have little confidence in SMC to fully comply with an NSW EPA EPL if approval is granted
- Request that contact details and protocols be provided to local residents and businesses, including the Malt Shovel Brewery, to advise on all potential safety incidents
- Confirmation of asbestos removal, by SafeWork NSW, has not been provided to the public for preceding WestConnex component projects.

Response

Previous WestConnex component projects (M4 East and New M5) were approved with the condition that measures to monitor and manage dust and contaminated materials were developed and implemented through a CEMP. Measures implemented to control impacts at the M4 East and New M5 construction ancillary facilities include dampening work areas, covering inactive areas, monitoring weather conditions and regular inspections. Air quality monitoring is carried out to identify any airborne particulate matter and asbestos fibres.

Several management measures have been identified to specifically address the potential contamination risks from the M4-M5 Link project. These measures include commitments for the development of plans and procedures to control the management of contamination, including asbestos and acid sulfate soils. Should the project be approved, the design and construction contractor(s) will be required to implement these management measures. Specific measures include:

- Further targeted investigations in areas of identified medium and high risk contamination in the project footprint and the preparation of a RAP, if necessary
- A hazardous materials assessment will be carried out prior to and during the demolition of buildings. Demolition would be undertaken in accordance with the relevant Australian Standards and SafeWork NSW codes of practice

- A CWMP will be prepared that will include procedures for handling and storing potentially contaminated substances
- Stockpile management procedures will be implemented to control dust, odour and cross contamination
- Asbestos handling and management will be undertaken in accordance with an Asbestos Management Plan. Plans for asbestos would be site specific, developed to satisfy the SafeWork Australia *Asbestos Code of Practice and Guidance Notes*, NSW legislative requirements and relevant Australian and New Zealand Standards. They would include procedures for air monitoring, clearance inspections and reporting
- A CSWMP will be prepared for the project including procedures to manage potentially contaminated stormwater runoff and acid sulfate soils
- Erosion and Sediment Control Plans will be prepared for all work sites
- Temporary construction water treatment plants will be designed and managed so that treated water would be of suitable quality for discharge to the receiving environment
- The operational water treatment plants will be designed such that effluent will be of suitable quality for discharge to the receiving environment
- Discharge criteria for operational water treatment plants will be developed in accordance with the ANZECC (2000) and relevant NSW Water Quality Objectives
- A Construction Air Quality Management Plan will be developed and implemented to monitor and manage potential air quality impacts associated with the construction for the project. The management plan will include controls required to reduce the emission of dust out of the door of acoustic sheds
- Measures to reduce potential dust generation, such as the use of water carts, sprinklers, dust screens and surface treatments, will be implemented within project sites, as required
- At the commencement of establishment of project ancillary facilities, controls such as wheel washing systems and rumble grids will be installed at all site exits to prevent deposition of loose material on sealed surfaces outside project sites to reduce potential dust generation
- Areas of soil exposed during construction will be minimised at all times to reduce the potential for dust generation
- Exposed soils will be temporarily stabilised during weather conditions conducive to dust generation and prior to extended periods of inactivity to minimise dust generation

  Exposed soils will be permanently stabilised as soon as practicable following disturbance to minimise the potential for ongoing dust generation
- Regular site inspections will be conducted to monitor for potential dust issues. The site inspection, and issues arising, will be recorded.

The design and construction contractor(s) will be required to implement the management measures for the project (see **Chapter E1** (Environmental management measures)) and any conditions of approval. The design and construction contractor(s) will be required to consult and communicate with stakeholders and the community during detailed design and construction, the details of which will be included in a Community Communication Strategy to be developed for the project.

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C17 Flooding and drainage

This chapter addresses issues raised in community submissions associated with the flooding and drainage assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 17 (Flooding and drainage) and Appendix Q (Technical working paper: Surface water and flooding) of the EIS for further detail on the flooding and drainage assessment.

Contents

C17.1 Level and quality of flooding and drainage assessment

274 submitters raised concerns about the flooding and drainage assessment. Refer to section 17.1 of the EIS and Chapter 3 of Appendix Q (Technical working paper: Surface water and flooding) of the EIS for details of the flooding and drainage assessment methodology.

C17.1.1 Methodology and adequacy of assessment of flooding and drainage

Submitters expressed concern about the adequacy and independence of the flooding and drainage impact assessment. Specific concerns included:

- That the EIS contains uncertainties and little information on the risk of flooding and it does not meet the standards of an EIS
- That the existing flood depth at the western end of Bignell Lane near Pyrmont Bridge Road is predicted to be up to one metre in a 100 year average recurrence interval (ARI) event and that this location is identified by the NSW Government Floodplain Development Manual (2005) as a high flood hazard area
- Lack of recognition of the impacts of pavement drainage at Haberfield/Ashfield
- The EIS does not adequately take into account historic drainage works at Newtown and Annandale which occurred in the late 19th century and may not be able to cope with the scale of tunnelling works
- There is no detail as to how the issues with flooding at Darley Road would impact on the area.

Response

The flooding assessment in the EIS was prepared in accordance with the relevant Secretary's Environmental Assessment Requirements (SEARs) issued by the Secretary of the NSW Department of Planning and Environment (DP&E) and the associated desired performance outcomes that relate to flooding.

The assessment of potential flooding impacts of the project on existing flood regimes has been conducted in accordance with the requirements of the *Floodplain Development Manual* (NSW Department of Infrastructure, Planning and Natural Resources (now the NSW Office of Environment and Heritage (OEH) 2005)), which incorporates the NSW Government's Flood Prone Land Policy. Other relevant government policies and guidelines were also considered as part of the assessment of the project's potential flooding and drainage impacts. The floodplain planning provisions of the local environmental plans and development control plans applicable to the Inner West (formerly Ashfield, Leichhardt and Marrickville) and the City of Sydney local government areas (LGAs) have been considered as part of the assessment.

The assessment therefore provides an adequate level of detail as required by the SEARs, relevant legislative requirements and government policies and guidelines. Potential flooding impacts on existing drainage infrastructure and adjoining properties are assessed in section 17.3.1 and section 17.4.4 of the EIS, for construction and operation of the project respectively.

Construction impacts have been considered in the assessment across all areas of the project footprint, including all pavement surfaces associated with construction, both within the ancillary facilities (including those proposed at Haberfield and Ashfield) and surrounding areas. Flooding during construction of the project could potentially impact areas within and near the construction sites, including damage to facilities and infrastructure. Where drainage systems are to be upgraded or replaced during the project, existing systems will be left in place and remain operational during the process wherever possible.

All construction works would have the potential to impact local overland flow paths. Disruption of existing flow paths, both of constructed drainage systems or overland flow paths, could occur as a result of:

- Disruption of existing drainage networks during decommissioning, upgrade or replacement of drainage pits and pipes
- Interruption of overland flow paths by installation of temporary construction ancillary facilities
- Sediment entering drainage assets and causing blockages

- Overloading the capacity of the local drainage system.

These are typical impacts faced on most construction projects and would be addressed by adopting industry standard mitigation measures. Consideration of these impacts would be included during future detailed design and construction planning phases, along with consideration of the typical mitigation measures described in **Chapter E1** (Environmental management measures).

For operation, there is limited existing drainage infrastructure at many of the project sites that would be impacted or need to be modified. For the operational sites, the surface water runoff would be managed to minimise flood impacts on adjoining properties. Where the operational sites propose to connect directly to existing drainage infrastructure, flow rates from the sites would match existing flow rates where possible so as not to overload the existing drainage system or cause adverse flood impacts on adjoining properties. Further hydrological and hydraulic modelling based on the detailed design will be undertaken to determine the ability of the receiving drainage systems to effectively convey operational drainage discharges from the project.

Potential flooding impacts at Bignell Lane (as part of the Pyrmont Bridge Road tunnel site (C9)) and Darley Road have been assessed in section 17.1 of the EIS. Impacts and proposed management measures in these areas are discussed in **section C17.2.4** and **section C17.2.2**.

Potential impacts on existing buildings and infrastructure due to ground settlement from tunnelling works have been assessed in sections 12.3.4 and 19.3.8 of the EIS. See **section C19.1** and **section C12.5** for further details.

C17.1.2 Concern regarding flooding impacts on the Rozelle interchange

A submitter was concerned that the location of the tunnels at Rozelle is in the vicinity of an old watercourse which aligns with the 100 year ARI.

Response

The surface components of Rozelle interchange (including tunnel portals) would be located within the extent of the probable maximum flood (PMF). The Rozelle interchange would be located within and adjacent to the Rozelle Rail Yards, which functions as a floodway and provides a significant amount of storage of floodwater in larger events. The existing flood risks and potential construction and operational impacts of the project have been considered in Chapter 17 (Flooding and drainage) of EIS.

Due to the high risk of flooding at the Rozelle interchange, the proposed layout and design has been influenced by flood risk and drainage considerations. An assessment of potential flood impacts at the proposed Rozelle interchange was undertaken.

Around the Easton Park drain (north of the Rozelle interchange) and along Whites Creek, the installation of more efficient drainage channels as part of the project would reduce flood levels in those watercourses. In the remainder of the Rozelle Rail Yards site, the proposed new buildings and other infrastructure would be raised above ground for flood protection.

To retain the existing function of the site as a flood storage area, minimise impacts in the 100 year ARI event and mitigate the potential increase in flood risk for surrounding properties, the design includes:

- Large transverse conveyance systems for the existing Easton Park drain and the catchment to the west, passing through the interchange under City West Link and discharging into Rozelle Bay
- An increase to the waterway area for the Whites Creek bridge structure under The Crescent.

The flood modelling suggests that this approach, combined with improved local road drainage along Lilyfield Road to convey runoff to the Easton Park drain, is likely to reduce potential impacts to an acceptable level (ie no adverse flood impacts on adjoining properties for the 100 year ARI event).

All entries (portals) into the tunnels will be designed so that they are located above the peak level of the PMF or the 100 year ARI design flood plus 0.5 metres, whichever is greater. The same hydrologic standard will be applied to tunnel ancillary facilities such as tunnel ventilation and emergency response facilities, electrical substations and water treatment plants, where the ingress of floodwaters will also have the potential to flood the tunnel (see **Chapter E1** (Environmental management measures)).

Groundwater inflows within the tunnels will be minimised by designing the final tunnel alignment to minimise intersections with known palaeochannels and alluvium present in the project footprint (such as at Rozelle). This is discussed further in **section C19.1.1**.

C17.1.3 Assessment of drainage infrastructure impacts

A submitter was concerned with the assessment of drainage impacts and drainage system failure impacts on flooding and suggested that the EIS should not be approved as it has not properly explained or assessed these impacts. In particular, the following concerns were raised:

- The EIS has not assessed how the identified risk to the existing drainage network (disruption or blockage of existing drains) will cause increased risk of flood damage to flood lots. The submitter was particularly concerned with Darley Road and adjacent streets such as Hubert Street
- The EIS fails to take into account the Inner West Council's Leichhardt Floodplain Risk Management Plan which contains recommended flood modification options
- The EIS has not assessed if the project drainage infrastructure will impede the Inner West Council's Leichhardt Floodplain Risk Management Plan option HC_FM3 to lay additional pipes/culverts from Elswick Street to Hawthorne Canal (via Regent Street and Darley Road)
- The EIS has not assessed if the project drainage infrastructure will impede Inner West Council's Leichhardt Floodplain Risk Management Plan option HC_FM4 to lay additional pipes/culverts from William Street to Hawthorne Canal via Hubert Street and Darley Road.

Response

The EIS includes an analysis of existing flood behaviours and drainage infrastructure in order to assess potential construction and operational impacts of the project. The EIS identified the waterways and associated catchments within the study area. Due to the extensive urban nature of the study area, there is a dense network of drainage infrastructure conveying stormwater flows for small storm events. These drainage features are illustrated and discussed in section 17.2.2 of the EIS. Section 17.3.1 of the EIS assesses the potential impacts on flooding and drainage, which includes consideration of the existing flood risk. Damage to facilities, infrastructure, equipment, stockpiles and downstream sensitive areas caused by inundation from floodwaters is considered as a potential impact.

Section C17.2.2 addresses the potential impacts at the Darley Road civil and tunnel site (C4), including Hubert Street.

Further hydrological and hydraulic modelling based on the detailed design will be undertaken to determine the ability of the receiving drainage systems to effectively convey drainage discharges from the project once operational. The modelling must be undertaken in consultation with the relevant council(s). It will include, but not be limited to:

- Confirming the location, size and capacity of all receiving drainage systems affected by the operation of the project
- Assessing the potential impacts of drainage discharges from the project drainage systems on the receiving drainage systems
- Identifying all feasible and reasonable mitigation measures to be implemented where drainage from the project is predicted to adversely impact on the receiving drainage systems.

Management measures to minimise impacts on stormwater drainage systems will be implemented, and include measures such as:

- Where drainage systems are to be upgraded or replaced during the project, existing systems will be left in place and remain operational during the process wherever possible
- Runoff generated from project construction and operational facilities and discharges from water treatment facilities will be managed to mitigate risk of overloading the receiving drainage system
- Entry points to the stormwater used by or immediately downgradient from the project sites will be inspected regularly for blockages and cleaned as required to maintain performance.

These measures (see environmental management measures FD12 to FD14) are also outlined in **Chapter E1** (Environmental management measures).

Several studies were taken into account in the flooding and drainage assessment, including the Leichhardt Flood Study (Cardno 2014). The updated Leichhardt Floodplain Risk Management Study, published in May 2017 (Cardno 2017) which outlines various flood modification options (involving new or upgraded infrastructure), such as HC_FM3 and HC_FM4 mentioned in the submission, was not considered in the flooding and drainage assessment for the project as the document was not publicly available at the time that the EIS was being prepared. The assessment of flood behaviour (existing and future) in the EIS was therefore based on the flood study of 2014.

Consultation with the Inner West Council will be undertaken during future detailed design and construction phase planning to take into consideration specific flood modification options developed as part of the Leichhardt Floodplain Risk Management Study in the vicinity of the project footprint. It is noted that HC_FM3 is not located in close proximity to the project footprint and therefore this proposed flood modification option is unlikely to be affected by the project.

C17.2 Hydrology and flooding impacts

248 submitters raised concerns about impacts on hydrology and flooding during construction and operation. Refer to section 17.3 and 17.4 of the EIS and sections 5.2 and 6.2 of Appendix Q (Technical working paper: Surface water and flooding) of the EIS for details of potential hydrology and flooding impacts during construction and operation.

C17.2.1 General hydrology and flooding impacts

Submitters were concerned about flood impacts as a result of the project in general and in particular a submitter was concerned about the proposed route of WestConnex being through areas which are prone to flooding due to their geographic situation and poor infrastructure.

Response

Section 17.2 of the EIS included consideration of the existing project area, including catchments and watercourses, existing drainage and surface water management infrastructure, and existing flood behaviour. Flood modelling was undertaken to inform the development of the concept design and the assessment in the EIS. As part of this assessment, potential operational impacts were identified, including flooding risks in certain areas of the project footprint.

It is recognised that areas such as the Rozelle interchange would be partially located within the PMF flood extent, which has the potential to impact on the interchange and tunnel portals. Therefore, mitigation measures are required to prevent any floodwater ingress to the tunnels during these events. The design of the interchange would prevent flooding of the portals for events up to the PMF or the 100 year ARI event plus 0.5 metres freeboard (whichever is greater). Freeboard is a safety factor for greater protection against different types of flooding and is typically expressed in metres above a flood level for flood protection or control works.

Preventing floodwater ingress has the potential to displace floodwaters where the surface features block existing flow paths, or reduce available floodplain storage. This may result in potential impacts on surrounding properties. This is particularly the case at the Rozelle Rail Yards, as this area functions as a floodway and provides a significant amount of storage of floodwater in larger events such as the 100 year ARI event and PMF. To mitigate the potential flood risk for surrounding properties due to the proposed Rozelle interchange, a number of measures were incorporated into the concept design including:

- Provision of large transverse conveyance systems for the existing Easton Park drain and the catchment to the west passing through the Rozelle Rail Yards and under City West Link and discharging into Rozelle Bay
- Increase of the waterway area for the Whites Creek bridge structure under The Crescent.

Potential impacts at the Rozelle Rail Yards are discussed in **section C17.1.2**, and impacts in specific areas are discussed further in the following sub-sections.

Management measures that will be implemented to minimise risks of flooding are discussed in section **C17.5** and provided in full in **Chapter E1** (Environmental management measures). As part of the Flood Mitigation Strategy that will be prepared, limiting flooding characteristics to the following levels will be considered:

- A maximum increase in inundation time of one hour in a 100 year ARI rainfall event
- No inundation of floor levels which are currently not inundated in a 100 year ARI rainfall event
- A maximum increase of 10 millimetres in inundation at properties where floor levels are currently exceeded in a 100 year ARI rainfall event
- A maximum increase of 50 millimetres in inundation at properties where floor levels will not be exceeded in a 100 year ARI rainfall event

- Or else provide alternative flood mitigation solutions consistent with the intent of these limits.

The design will be developed in accordance with the criteria to minimise the potential for adverse flood level and behaviour changes in adjacent areas, due to water displaced during construction and operation.

A thorough assessment has been undertaken to predict the likely flooding impacts as a result of the project and further assessment will be carried out prior to construction. This is discussed further in **section C17.1.1** and **section C17.5**.

C17.2.2 Flooding impacts at Darley Road civil and tunnel site (C4)

Submitters raised concerns regarding flooding impacts from the project as Darley Road and adjacent streets (such as Hubert Street) are located within a flood zone. Submitters noted that there have been ongoing issues with flooding in this area requiring remedial work. Specific concerns relating to flooding and the Darley Road civil and tunnel site (C4) include:

- The project will worsen the existing flooding risk, including to residents of Hubert Street
- The project creates an unacceptable risk of flooding and associated damage
- A major tunnelling site should not be permitted at the proposed location on Darley Road due to the potential flooding impacts
- The flood impact will be exacerbated by the disruption or blockage of existing drainage networks, which are risks identified in the EIS
- There is no detail as to how the issues and hazards associated with flooding at Darley Road will be managed or the potential impact on the area
- Other alternatives to the Darley Road site are not prone to flooding
- A drainage assessment and significant drainage works would be required to prevent exacerbation of the existing flooding problem in this area, which may be impacted by the proposed kerbside traffic lane on the southern side of Darley Road
- The flooding mitigation measures suggested for the Darley Road civil and tunnel site (C4) are inadequate.

Response

The Darley Road civil and tunnel site (C4) is in the catchment of the Hawthorne Canal, on the fringe of the 100 year ARI flood extent. However, under existing circumstances, most of the site may be inundated in a PMF, particularly the western half, with predicted depths of up to 0.5 metres within the site and up to one metre around the intersection of Darley Road and Charles Street.

The EIS included an assessment of potential flooding impacts during construction at the Darley Road civil and tunnel site (C4) in section 17.3 of the EIS. The likelihood of flooding and a summary of the potential impacts on the Darley Road civil and tunnel site (C4) are provided in **Table C17-1**.

An assessment of potential flood impacts at the Darley Road site for events up to the PMF event was undertaken by assuming bunds/walls around most of the site in order to prevent floodwater ingress to the water treatment plant and substation.

Table C17-1 Potential flooding impacts at the Darley Road civil and tunnel site (C4)

Construction ancillary facility (C4) components	Existing flood risk (source, mechanisms)	Potential flood impacts
· Temporary access tunnel for construction · Buildings and laydown area · Parking · Acoustic shed and spoil handling area · Temporary substation	Hawthorne Canal catchment. Localised shallow flooding from 10 year ARI and 100 year ARI flowpath from the light rail line. Majority of the site may be inundated in a PMF with depths up to 0.5 metres at the western end of the site. (Refer to Hawthorne Canal Flood Study (2013), Leichhardt Flood Study (2014), AECOM flood modelling (2016)).	Potential displacement of water due to bunding of tunnel ramps to prevent floodwater ingress, as well as presence of temporary noise walls, buildings, hoarding, acoustic shed, stockpiles and other structures.

Flood protection for vulnerable infrastructure, such as the Darley Road motorway operations complex (MOC1) need to be set at PMF flood level or 100 year ARI plus 0.5 metres, whichever is the greater. At the Darley Road site, there are locations where the 100 year ARI level plus 0.5 metres is greater than the PMF level.

It was found that the water exclusion strategy for the vulnerable infrastructure on the site (water treatment plant and substation) would lead to localised increases in flood levels on Darley Road and the Inner West Light Rail line in the vicinity of the light rail stop. Surrounding properties would not be adversely impacted in the events up to the 100 year ARI. In the PMF, minor flood impacts of up to 0.3 metres are estimated to the west of the site along Darley Road and Charles Street. Impacts on the Inner West Light Rail line would need to be managed in consultation with Transport for NSW by either providing a managed flow path through the site, while still protecting vulnerable infrastructure, and/or by providing additional piped drainage systems. This strategy would be further developed during detailed design when site layouts are finalised.

Peak flow velocities along Darley Road would be similar to existing conditions at 1.5 metres per second. Provisional flood hazards would also be similar to existing conditions.

Ingress of floodwater into the tunnel shafts or cut-and-cover excavations during construction would pose a risk to personal safety for those working in the tunnel. Where these facilities occur within the floodplain, such as at the Darley Road civil and tunnel site (C4), protection measures such as bunding or floodwater barriers would be provided to ensure floodwaters do not enter shafts or portals.

All construction works would have the potential to impact local flow paths. Potential circumstances leading to the disruption of existing flow paths, both of constructed drainage systems and the overland flow paths, are outlined in **section C17.1.1**. This includes sediment entering into drainage assets and causing blockages. These are typical impacts faced on most construction projects and would be addressed by adopting industry standard mitigation measures (see **Chapter E1** (Environmental management measures)).

Further hydrologic and hydraulic assessments will be carried out for all temporary project components (Darley Road civil and tunnel site (C4)) and permanent design features that have the potential to affect flood levels in the vicinity of the project footprint, such as the water treatment plant, substation and carpark area. The results of the assessment will inform the preparation of the Flood Mitigation Strategy as well as the design development of temporary and permanent works (see environmental management measure FD02 in **Chapter E1** (Environmental management measures)).

The assessment in the EIS determined that the application of mitigation and design measures, including further hydrologic and hydraulic assessment, would be sufficient to mitigate potential flooding impacts during construction at the Darley Road civil and tunnel site (C4). There is a low risk of flood in nearby properties on both Darley Road and Hubert Street due to the small volume of water that would be displaced at the site during construction (refer to section 17.4.1 of the EIS).

Potential flood impacts associated with the proposed operational infrastructure at the Darley Road motorway operations complex (MOC1) was also considered. There would be a low risk of flood impacts to nearby properties and infrastructure as the required overland flow paths and drainage systems can be incorporated into the final site layout during detailed design.

C17.2.3 Flooding impacts near Whites Creek

A submitter was concerned that part of the project on the shores of Whites Creek would constrain the channel and could cause flooding further upstream in residential areas.

Response

The lower reach of Whites Creek is located to the south of the proposed Rozelle interchange and associated road upgrades. Proposed works in this area include the redevelopment of City West Link and The Crescent intersection, raising the level of sections of these roads, the construction of new culverts into Rozelle Bay, in addition to upgrade and widening of the existing bridge structure that crosses Whites Creek at The Crescent. The surface works at Rozelle would include widening and improvement works to the channel and bank of Whites Creek between the light rail bridge and Rozelle Bay at Annandale, to manage flooding and drainage for the surface road network. The Crescent would be realigned to the west of its current alignment, adjacent to the light rail corridor before crossing over Whites Creek.

Potential displacement of water by hoardings, buildings, stockpiles and other structures is recognised as a potential construction impact at The Crescent civil site (C6) where construction of Whites Creek bridge will occur. The need to maintain flood conveyance will be factored into construction planning associated with the new bridge structure over Whites Creek and a Flood Mitigation Strategy will be prepared and implemented considering all flood risks to the project and adjoining areas (see **Chapter E1** (Environmental management measures)).

No adverse operational flood impacts are anticipated along Whites Creek in events up to and including the 100 year ARI event, which is the generally accepted flood planning level. The concept design has been developed to minimise flood impacts up to the 100 year ARI event. In flood events greater than the 100 year ARI, some flood impacts are estimated along Whites Creek (up to 0.4 metres in the PMF). This is a result of the larger footprint of the proposed road embankments and wider bridge structure (compared to existing). Further widening of the Whites Creek channel is constrained by the existing light rail embankment and raising the road levels on City West Link would potentially raise flood levels and lead to greater flood impacts.

It is generally not physically, environmentally or economically feasible to provide measures to mitigate flood impacts in the PMF. It is also noted that under existing conditions significant flooding already occurs along Whites Creek in the PMF, with flood depths of greater than 2.5 metres. Therefore, a risk-based approach is generally adopted for flood events greater than the 100 year ARI. The changes in flood behaviour under PMF conditions would therefore be investigated further during detailed design to confirm potential impacts on critical infrastructure and address changes in flood hazard as a result of the project. Where peak levels in the 100 year ARI design flood are predicted to increase at any residential, commercial and/or industrial buildings due to construction or operation of the project, a floor level survey will be carried out and further refinements will be made to the temporary or permanent designs as required to minimise impacts.

C17.2.4 Flooding impacts at the Pyrmont Bridge Road tunnel site (C9) at Camperdown

Submitters were concerned with the Pyrmont Bridge Road tunnel site as parts of it are prone to flooding.

Response

The existing flood behaviour at the Pyrmont Bridge Road tunnel site (C9) is described in section 17.2.3 of the EIS. The Pyrmont Bridge Road tunnel site (C9) is located near the top of the Johnstons Creek catchment. There is only a small catchment draining to the site, but the dense existing built environment means that a substantial amount of runoff is channelled along Bignell Lane, with water ponding at the low point along this lane. The local drainage system connects to the road drainage system on Pyrmont Bridge Road before draining towards Johnstons Creek.

The Leichhardt Flood Study identified flood depths generally between 0.1 metres and 0.2 metres along Bignell Lane and up to one metre at the low point towards the western end of Bignell Lane in the 100 year ARI event. Given the small catchment size, the relatively high flood depths are a result of the confined overland flow path.

During construction, the existing buildings on the site are proposed to be demolished and replaced with facilities, which would cover a smaller area. This would allow for less concentrated overland flows paths, greater opportunity for infiltration and would also reduce the potential to displace water and impact surrounding properties. With appropriate site drainage to manage runoff at the Pyrmont Bridge Road tunnel site (C9), the risk of flooding to the site from overland flow is considered to be low. Measures would include a combination of temporary piped drainage, open drains and swales, overland flow paths and sedimentation and erosion control measures.

No permanent operational infrastructure is proposed at the Pyrmont Bridge Road tunnel site (C9).

C17.3 Drainage

37 submitters raised concerns about impacts on drainage during construction. Refer to section 17.3 of the EIS and section 5.2 of Appendix Q (Technical working paper: Surface water and flooding) of the EIS for details of potential drainage impacts during construction.

C17.3.1 Impacts of the project on existing drainage infrastructure

Submitters raised concerns about the impacts on existing drainage infrastructure. Specific concerns related to:

- The project will worsen the condition of the existing stormwater junction at Leichhardt, which has a history of incidents. A submitter requested that in the case of an emergency, a specialist should attend the problem within 24 hours and there should be collaboration with Sydney Water in this regard
- The proposed kerbside traffic lane on the southern side of Darley Road would conflict with the existing stormwater drainage inlet structures
- Impacts from flooding which, amongst other things, may disrupt drainage systems. There is no detail in the EIS as to how these issues will be managed at Darley Road and their potential impact on the area
- Concerns regarding the high flood hazard near Darley Road which could result in disruption to existing drainage. This is not an appropriate dive site and these issues have not been properly assessed
- Impacts of tunnelling on the stormwater drainage pipe underneath Denison Street and Easton Park. Damage to this pipe could cause damage to properties in times of heavy rainfall, resulting in unintended flood damage around Albert, Foucart, Cheltenham and Denison streets
- Historical drainage works (old streams and storm drains) at Newtown and Annandale would not be able to contend with the scale of tunnel works.

Response

The EIS discusses existing sources of flooding to the west of the Darley Road civil and tunnel site (C4) (the junction of Darley Road and Canal Road/Charles Street) at Leichhardt. Flooding impacts at the Darley Road civil and tunnel site at Leichhardt are considered further in **section C17.2.2**.

Construction would have the potential to impact existing drainage paths and drainage infrastructure. Disruption of existing drainage systems could occur as a result of sediment entering drainage assets and causing blockages, overloading the capacity of the local drainage system due to the generation of additional runoff or interruption of overland flow paths by installation of temporary construction ancillary facilities.

Access into the Darley Road construction ancillary facility (see **section C8.2.2** for updated traffic (including access) impacts regarding the site) is not expected to impact on the existing drain along the south side of Darley Road. This would be confirmed during detailed design.

There is limited existing drainage infrastructure at many of the sites that would be impacted or need to be modified due to the M4-M5 Link project. For the operational sites, the surface water runoff would be managed to minimise flood impacts on adjoining properties. Where the operational sites propose to connect directly into existing drainage infrastructure, flow rates from the sites would match existing flow rates where possible so as not to overload the existing drainage system or cause adverse flood impacts on adjoining properties. The assessment of impacts on drainage infrastructure is discussed further in **section C17.1.1**.

Where drainage systems are to be upgraded or replaced during the project, existing systems will be left in place and remain operational during the process wherever possible, and runoff generated from project construction and operational facilities will be managed to mitigate risk of overloading the receiving drainage system. Further hydrological and hydraulic modelling based on the detailed design will be undertaken to determine the ability of the receiving drainage systems to effectively convey drainage discharges from the project once operational and upgrades made where required.

Easton Park drain conveys runoff from the suburb of Rozelle and runs between Denison Street adjacent to Easton Park and Rozelle Bay. It is proposed to divert the Easton Park drain at Rozelle into a new channel to convey flows through the Rozelle Rail Yards. Once these diversions works are complete, the former Easton Park drain would be decommissioned. The new channel for Easton Park drain and the other proposed channels within the Rozelle Rail Yards will be larger than the current drains and include a 'low-flow' channel to carry flows of around a two year ARI event, with a defined landscaped overland flow path sized to convey larger flows up to the 100 year ARI. Given the artificial nature of the existing waterway, the decommissioning of the existing drain would be unlikely to impact on natural processes. Around the Easton Park drain, the installation of more efficient drainage channels as part of the project would reduce flood levels and reduce inundation times, therefore, it is not expected that any flood impacts in the areas around the Easton Park drain, such as Albert, Foucart, Cheltenham and Denison streets.

Tunnelling in the vicinity of the Easton Park drain is expected to range between approximately 15 and 23 metres in depth (noting that there could be multiple intersecting tunnels associated with proposed future projects). The associated ground movement that would occur due to settlement may pose the potential to affect Easton Park drain. Potential impacts on infrastructure due to ground settlement from tunnelling works have been assessed in sections 19.3.8 and section 12.3.4 of the EIS. See **section C19.1** and **section C12.5** for further details. Interface agreements will be entered into with the owners of infrastructure and utility services likely to be impacted by construction of the project. The agreements will likely identify:

- Minimum separation distances and appropriate settlement criteria for utility infrastructure
- Settlement monitoring requirements during construction
- Contingency actions in the event that settlement limits are exceeded.

A Flood Mitigation Strategy will be prepared by a suitably qualified and experienced person in consultation with relevant agencies, including the State Emergency Services and Sydney Water and local councils. A flood review report will also be prepared after the first defined flood event affecting the project works for any of the following flood magnitudes – the five year ARI event, 20 year ARI event or 100 year ARI event - to assess the actual flood impact against those predicted in the design reports or as otherwise altered by the Flood Mitigation Strategy. See **Chapter E1** (Environmental mitigation measures) for further details of these measures.

C17.4 Cumulative flooding and drainage impacts

C17.4.1 Cumulative flooding and drainage impacts

One submitter raised concerns about cumulative flooding and drainage impacts of the project. Refer to section 26.4 of the EIS for an assessment of cumulative flooding and drainage impacts.

A submitter was concerned about the cumulative flooding and drainage impacts of the project. The specific concern was that key issues involving flooding and drainage for the King Street Gateway, Alexandria to Moore Park Connectivity Upgrade, Parramatta Road pinch point project, Parramatta Road bus rapid transit and future light rail, and the Johnstons Creek and Iron Cove Creek naturalisation works, should be assessed in the EIS.

Response

Cumulative flooding and drainage impacts are addressed in section 26.4.10 of the EIS and Chapter 7 of Appendix Q (Technical working paper: Surface water and flooding) of the EIS. The projects mentioned in the submissions were all considered however were not included in the cumulative impact assessment, as explained in Appendix C (Cumulative impact assessment methodology) of the EIS. Reasons for this include that the design of the projects are at an early stage, there was insufficient public information available and the impacts and timing of the projects were not yet known at the time of the EIS.

An assessment of cumulative impacts associated with other projects in the vicinity of the M4-M5 Link, in particular other WestConnex component projects, such as the M4 East and New M5 projects, has been carried out. The assessment also considered other relevant projects such as the CBD and South East Light Rail maintenance depot at Rozelle and proposed future Western Harbour Tunnel and Beaches Link program of works. The projects currently under construction all incorporate surface water and flood management measures during construction and operation to prevent adverse impacts to the common receiving receptors and adjoining properties.

Other projects that are still in the early planning stages, such as those mentioned in the submission, will be required to undertake their own cumulative impact assessment and likely be required to implement similar mitigation measures in accordance with legislative requirements to prevent adverse cumulative impacts. There is unlikely to be significant impacts on common sensitive receiving environments downstream provided controls are implemented, maintained and monitored.

C17.5 Flooding and drainage environmental management measures

C17.5.1 Flooding and drainage environmental management measures

150 submitters raised concerns about the environmental management measures for flooding and drainage impacts. See **Chapter E1** (Environmental management measures) for further details on the flooding and drainage environmental management measures.

Submitters raised concerns about the flooding and drainage environmental management measures. Specific concerns related to:

- The flooding mitigation measures are inadequate
- There are no details of how flooding issues would be managed at Darley Road
- The project should be required to fund Inner West Council's flood mitigation options at Darley Road to compensate for disruption and negative impacts to residents in the area
- Provision of water sensitive urban design at redevelopment sites like the Rozelle Rail Yards recreation area should be a priority, to reduce overland flow and flooding.

A submitter supported the measures to minimise flooding and manage discharge of sediment into Rozelle Bay.

Response

Several management measures have been developed based on the assessment of potential flooding and drainage impacts assessed in the EIS (see **Chapter E1** (Environmental management measures)). These include prescriptive commitments to inform the detailed design as well as commitments to develop strategies based on further assessment that will be carried out prior to the commencement of construction. These include:

- A Flood Mitigation Strategy will be prepared by a suitably qualified and experienced person in consultation with directly affected landowners, Department of Primary Industries-Water, State Emergency Services (SES), Sydney Water and the relevant local councils (see environmental management measure FD01). As discussed in **section C17.1.3**, consultation with councils will consider council plans such as the flood modification options in the Leichhardt Floodplain Risk Management Study

- Hydrologic and hydraulic assessments will be carried out for all temporary project components (including all ancillary facilities) and permanent design features that have the potential to affect flood levels in the vicinity of the project (see environmental management measure FD02), to inform the development of the Flood Mitigation Strategy
- A flood review report will be prepared after the first defined flood event affecting the project works for any of the following flood magnitudes – the five year ARI event, 20 year ARI event and 100 year ARI event - to assess the actual flood impact against those predicted in the design reports or as otherwise altered by the Flood Mitigation Strategy (see environmental management measure FD17)
- Measures developed to manage potential flood impacts, as identified in the Flood Mitigation Strategy, will be incorporated into the design of temporary and permanent project components and construction and operational management systems as relevant (see environmental management measure FD03)
- Bridge crossings over existing waterways and proposed drainage channels will be designed for the underside of bridge structure to be above the peak 100 year ARI design flood level (see environmental management measure FD05)
- Where peak levels in the 100 year ARI design flood are predicted to increase at any residential, commercial and/or industrial buildings due to construction or operation of the project, a floor level survey will be carried out. If the survey indicates flood impacts in excess of the limits set in FD01, further refinements will be made to the temporary or permanent designs as required to minimise impacts (see environmental management measure FD16).

Consideration would be given to Water Sensitive Urban Design (WSUD) measures such as wetlands, swales and bioretention facilities where feasible (including the proposed constructed wetland and bioretention systems at Rozelle).

For the full list of environmental management measures, see **Chapter E1** (Environment management measures). It is considered that these measures will minimise the risk of impacts on flooding behaviour or drainage systems as a result of the project. These mitigation measures will be funded by the project.

The submission supporting the measures to minimise flooding and manage discharge of sediment is noted.

C18 Biodiversity

This chapter addresses issues raised in community submissions associated with the biodiversity assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 18 (Biodiversity) and Appendix S (Technical working paper: Biodiversity) of the EIS for further detail on the biodiversity assessment.

Contents

C18.1 Level and quality of assessment

73 submitters raised concerns about the level and quality of the biodiversity assessment undertaken. Refer to section 18.1 of the EIS and Appendix S (Technical working paper: Biodiversity) for details of the biodiversity assessment undertaken.

C18.1.1 Level and quality of biodiversity assessment

Submitters have raised concerns regarding the level and quality of the biodiversity impact assessment.

Specific concerns include:

- The EIS did not fulfil its obligations to the Secretary's Environmental Assessment Requirements (SEARs) for assessing the impacts on biodiversity, especially regarding the risk to the vulnerable and threatened species, the Eastern Bentwing-bat (*Miniopterus schrebbersii oceanensis*). Submitter is concerned that the impact assessment of the project on this species was inadequate
- The EIS stated that investigations would be undertaken to confirm whether the Victoria Road bridge is a potential roost site for microbats. The investigation of this issue is critical and should influence the design of the Victoria Road bridge so as to minimise impacts on the microbats
- The EIS made an unsatisfactory assessment of Buruwan Park in regards to its value as a nature corridor for wildlife
- The EIS did not consider the impacts of the project introducing *Phytophthora Cinnamomi* into the study area or how this would be managed

One submitter noted that they were pleased with the arborist assessment.

Response

The *NSW Biodiversity Offsets Policy for Major Projects* (NSW Biodiversity Offsets Policy) was developed by the NSW Office of Environment and Heritage (OEH) and introduced in 2014. As part of a major project application under the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act), a proponent is required to prepare an EIS that addresses the SEARs provided by the NSW Department of Planning and Environment (DP&E) for the project. The SEARs for the biodiversity assessment provided by DP&E have been fully addressed (see discussion below and refer to Appendix B (Secretary's Environmental Assessment Requirements checklist) and section 1.3 of Appendix S (Technical working paper: Biodiversity) of the EIS).

Under the NSW Biodiversity Offsets Policy, the SEARs required the Framework for Biodiversity Assessment (FBA) to be applied to assess impacts on biodiversity in accordance with section 142B(1)(c) of the *Threatened Species Conservation Act 1995* (NSW) (TSC Act). The FBA outlines the assessment methodology to quantify and describe biodiversity values of a development site and the biodiversity offsets required for any unavoidable impacts. The SEARs also required any impacts on biodiversity values not covered by the FBA to be assessed. Impacts on species, populations and ecological communities that require further consideration are identified through consultation with the OEH (none of which were identified). The SEARs required that species specific field surveys be undertaken for those identified species and in accordance with the survey requirements specified by the OEH. In addition, the biodiversity assessment was undertaken in accordance with the survey guidelines specified in the SEARs and other relevant guidelines listed in section 1.4.2 of Appendix S (Technical working paper: Biodiversity) of the EIS.

The key components of the biodiversity assessment included:

- Desktop analysis to describe the existing environment and landscape features of the study area and to identify threatened terrestrial and aquatic values potentially affected by the project
- Field surveys to identify the biodiversity values of the project footprint and to determine the likelihood of threatened species and their habitats occurring in the project footprint or being affected by the project
- Qualitative assessment of potential impacts of the project on biodiversity values, including threatened species
- An aboricultural impact assessment, including a visual tree assessment for trees potentially affected by the project.

The EP&A Act does not require assessments of significance (seven part tests) under the TSC Act to be undertaken to determine if a Species Impact Statement is required because all major projects are automatically subject to comprehensive standardised assessment using the FBA. The *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) requires proponents to determine whether significant impacts are likely on all EPBC listed threatened species and ecological communities in accordance with national guidelines.

The only EPBC listed threatened species considered likely to be impacted by the project is the Grey-headed Flying-fox. An assessment in accordance with the *Commonwealth Significant Impact Guidelines* (Australian Government 2013) was undertaken for the Grey-headed Flying-fox and concluded that a significant impact to the Grey-headed Flying-fox is unlikely to occur as a result of the works as the species is highly mobile (refer to Annexure E of Appendix S (Technical working paper: Biodiversity) of the EIS).

The Eastern Bentwing-bat is not listed under the EPBC Act and therefore an assessment in accordance with the *Commonwealth Significant Impact Guidelines* (Australian Government 2013) was not undertaken. Notwithstanding this, the EIS assessed the potential impacts of the project on the Eastern Bentwing-bat and proposed environmental management measures to manage these impacts (see environmental management measure B2 in **Chapter E1** (Environmental management measures)). The EIS therefore went beyond the requirements of the OEH and the SEARs in its assessment of the Eastern Bentwing-bat. Refer to sections 5 and 9 and Annexure A (Table A.4) of Appendix S (Technical working paper: Biodiversity) of the EIS for the full discussion related to the Eastern Bentwing-bat. A response to concerns regarding the potential impacts of the project on the Eastern Bentwing-bat is provided in **section C18.3.1**.

Buruwan Park was considered in the biodiversity assessment through assessment of urban exotic and native vegetation cover, for which Buruwan Park is mapped (refer to Figure 4.3 in Appendix S (Technical working paper: Biodiversity) of the EIS). While the assessment acknowledges that in some areas the urban exotic and native cover provides feed trees and foraging habitat, the works proposed to be undertaken at Buruwan Park are unlikely to have a significant and long-term impact to wildlife nature corridors (see **section C18.3.1**).

Potential impacts of the project introducing *Phytophthora cinnamomi* (Phytophthora) into the study area was considered in section 9.4.9 of Appendix S (Technical working paper: Biodiversity) of the EIS). Phytophthora is a soil-borne fungus capable of causing tree death (dieback) by attacking the roots of native plants. Spores can be spread over large areas by water, vehicle and machinery movement as well as human and animal movement. 'Dieback caused by Phytophthora' is a listed key threatening process under both the EPBC Act and the TSC Act (OEH 2016d).

No sign of Phytophthora infection was identified during the field survey or literature search undertaken as part of the EIS. In addition, due to the highly urban context of the study area, it is unlikely that Phytophthora is present within the study area (refer to section 9.4.9 of Appendix S (Technical working paper: Biodiversity) of the EIS).

Prior to exhibition of the EIS, the biodiversity assessment was submitted to DP&E and relevant government agencies for an adequacy review and was considered to be adequate in meeting the SEARs.

The submitter's satisfaction with the arboricultural impact assessment is noted.

C18.2 Terrestrial flora impacts

Eight submitters raised concerns about the potential impacts on terrestrial flora. Refer to section 18.3 of the EIS for details of potential impacts on terrestrial flora.

C18.2.1 Reduction in existing vegetation

Submitters raised concerns over the loss of vegetation along the route (including trees) affecting biodiversity within the project footprint and leading to terrestrial flora impacts.

Response

The project is located in a highly urbanised environment and much of the area is entirely modified and disturbed and contains exotic species, weeds and planted native or non-indigenous species. It is characterised by urban parks, landscaped road verges, disused rail infrastructure, compacted soils, introduced fill, existing residential, commercial and light industrial development and other infrastructure. Vegetation in the project footprint is generally considered to be in poor ecological condition, with little ecological value and unlikely to have any native resilience or recovery potential. No native vegetation communities, known as Plant Community Types (as defined by the FBA), threatened ecological communities or threatened flora species have been identified as occurring or having the potential to occur within the project footprint. As such, the project would not involve the removal of any threatened flora species listed under the TSC Act or EPBC Act.

The Rozelle Rail Yards site management works, which is a separate project currently being undertaken by NSW Roads and Maritime Services (Roads and Maritime), involves the removal of all rail and rail related infrastructure, as well as vegetation, buildings and stockpiles from the site, to allow existing issues such as waste and noxious weeds to be appropriately managed. The impacts of these works, including the removal of vegetation from the site, were assessed through a Review of Environmental Factors (REF) under Part 5 of the EP&A Act and EPBC Act. Trees to be removed from the Rozelle Rail Yards as part of the separate M4-M5 Link project are shown in Map 4 and Map 5 of the Arboricultural Impact Assessment report, included as Attachment A of Annexure G of Appendix S (Technical working paper: Biodiversity) of the EIS.

Notwithstanding this, as many trees as possible will be retained during construction. In the event that tree removal cannot be avoided, a tree replacement strategy will be prepared. Replacement trees will be included in the UDLPs to be developed and implemented for the project (see environmental management measures B6 and OB9 in **Chapter E1** (Environmental management measures)). The project would deliver up to 10 hectares of open space at the Rozelle Rail Yards, which would provide a significant opportunity for replacement tree planting.

C18.3 Terrestrial fauna impacts

227 submitters raised concerns about the potential impacts on terrestrial fauna. Refer to section 18.3 of the EIS for details of potential impacts on terrestrial fauna.

C18.3.1 Impacts to fauna

Submitters expressed concern that the project would impact on native fauna (not considered threatened). A number of submitters raised particular reference to the following:

- Loss of ‘biodiversity hotspots’
- Impacts to wildlife present along Whites Creek and Buruwan Park as a result of loss of trees
- Impact to birds due to loss of trees, particularly the loss of small native bird habitat at the Rozelle Rail Yards including the Superb Fairy-wrens, Tawny Frogmouth, Eastern Yellow Robin and Grey Fantail
- The Rozelle Rail Yards is one of the only areas at Annandale/Glebe that has suitable Superb Fairy-wrens habitat
- Impacts on native fauna from air pollution.

Response

As described in **section C18.2.1,** the project is located in a highly urbanised and modified environment with the vegetation in the project footprint being of low ecological value. There would be no direct impacts to native vegetation communities (as defined by the FBA) due to the project; therefore potential threatened fauna are limited to those species that utilise urban environments and man-made structures.

The project was designed with the aim of avoiding impacts to potential habitat, where feasible. However, the clearing of exotic and non-native vegetation which could provide potential habitat for some fauna species would be unavoidable due to the required surface footprint of the project. Notwithstanding, given the highly urbanised context and the lack of existing remnant vegetation within the study area, the project is not likely to result in the loss of ‘biodiversity hotspots’.

The removal of trees around Buruwan Park and Whites Creeks would not have a significant and long term impact on wildlife, given that:

- Other vegetation within the locality (ie within 10 kilometres) provides foraging habitat and could also provide a nature corridor for wildlife, such as vegetation associated with the Cooks River to Iron Cove GreenWay corridor, drainage lines (eg riparian corridor at Whites Creek), urban parks (eg Easton Park), the light rail corridor, roadside vegetation and vegetated backyards
- The loss of Buruwan Park and trees adjacent to Whites Creek would be offset by the 10 hectares of open space to be created at the Rozelle Rail Yards
- Compensatory planting would be carried out where retention of trees is not possible and would seek to use opportunities presented by the new open space at the Rozelle Rail Yards. A tree replacement strategy and species recommendations for the landscape design, including foraging trees for the Grey-headed Flying-fox, will be included in the relevant Urban Design and Landscape Plans (UDLPs) (see environmental management measure OB9 in **Chapter E1** (Environmental management measures))
- Pre-disturbance inspection requirements to identify features of biodiversity conservation significance at Buruwan Park and adjacent to Whites Creek will be included in the CFFMP, as required by environmental management measure B1 (see **Chapter E1** (Environmental management measures)).

As described in **section C18.2.1**, the majority of vegetation to be removed from the Rozelle Rail Yards will be undertaken as part of the Rozelle Rail Yards site management works. Birds within the study area, including the Superb Fairy-wrens at Rozelle Rail Yards are mobile and have the ability to move on to similar habitat in the locality. In addition, Roads and Maritime is working with Inner West Council to support biodiversity enhancement projects within the local government area as part of the Rozelle Rail Yards site management works, which may compensate for some of the loss of foraging habitat at Rozelle Rail Yards. The UDLPs will guide the compensatory planting for trees to be removed by the project (see environmental management measure OB9 in **Chapter E1** (Environmental management measures)).

As discussed in section 9.7 of the EIS, most of the project footprint would experience no change or a small improvement in air quality as a result of the project. Impacts on native fauna from air pollution are therefore unlikely to result from the project.

C18.3.2 Impacts to threatened fauna

Submitters raised concerns regarding the potential for the project to impact native terrestrial fauna and/or endangered or threatened species, including the following:

- Microbats (including the Eastern Bentwing-bat and Yellow-bellied Sheathtail-bat)
- Impact to Koala population from the loss of habitat.

Response

An assessment of the potential impact to threatened fauna and loss of habitat was undertaken as part of the biodiversity assessment for the EIS (refer to Appendix S (Technical working paper: Biodiversity) of the EIS). The assessment concluded that a significant impact to threatened fauna as a result of the project is unlikely. The area in which the project is located is generally characterised as a highly urbanised environment. No remnant native vegetation occurs within the study area, as such, habitat for native species within the study area is limited to non-remnant native and exotic vegetation (such as planted street trees and exotic species). These landscape and vegetation characteristics generally do not provide preferred habitat for threatened fauna. Further, alternative non-preferred habitats are available in the locality such as cavities under bridges where the Eastern Bentwing-bat can shelter and exotic palm trees which the Grey-headed Flying-fox can feed on.

The Eastern Bentwing-bat was recorded during targeted surveys at the Rozelle Rail Yards and may be using the cavities of the Victoria Road bridge as a potential roosting (non-breeding) site, or as a flyway. However, no bats were observed within the cavities under the bridge during visual inspections carried out to inform the EIS. Section 18.3.1 of the EIS notes that no maternity colonies for the Eastern Bentwing-bat are known within the Sydney Metropolitan Catchment Management Authority area (OEH 2016a). This species breeds at maternal roosting sites within limestone caves in areas such as the Blue Mountains and migrates to Sydney and other areas for winter, returning to maternal roosts in summer.

The Victoria Road bridge is proposed to be replaced as part of the works to enable the M4 East/Iron Cove Link to Anzac Bridge exit ramp and the new east-west pedestrian and cyclist connection to be accommodated beneath (refer to section 5.6.5 of the EIS). If the bridge is being used as a roosting site by the Eastern Bentwing-bat, the roosting habitat would be lost during bridge demolition.

If present, the Eastern Bentwing-bat would be most at risk from indirect impacts associated with noise, vibration, light and dust during construction works for the Rozelle interchange. However, separation distances from these activities to the Victoria Road bridge would minimise these impacts. Further, as the Eastern Bentwing-bat is a highly mobile species, individuals are likely to actively avoid the area during construction and use alternative roosting sites in the locality (when they are not utilising material roosting sites outside of the metropolitan area).

Prior to the commencement of bridge demolition, an additional inspection will be carried out by a suitably qualified and experienced ecologist to confirm the presence of roosting microbats. If roosting microbats are identified, measures to manage potential impacts will be developed in consultation with an appropriate microbat expert and included in the Construction Flora and Fauna Management Plan (CFFMP) prior to the commencement of any work with the potential to disturb the roosting locations (as confirmed by the microbat expert) (see environmental management measure B2 in **Chapter E1** (Environmental management measures)).

Noise, light and/or vibration impacts on the Eastern Bentwing-bat may occur during operation of the new road infrastructure due to increased surface road traffic. However, the Eastern Bentwing-bat is a highly mobile species and the types of indirect impacts anticipated are already widespread within the highly urbanised study area. Given the presence of heavily trafficked roads in the vicinity, the species is likely to be somewhat resilient to noise, light and vibration impacts associated with increased traffic.

The Yellow-bellied Sheathtail-bat was tentatively recorded (as a possible call) during targeted surveys within the Rozelle Rail Yards. Being a primarily tree dwelling bat, the presence of the Yellow-bellied Sheathtail-bat in the project footprint is likely limited to foraging habitat. Construction noise, vibration, light and dust are not expected to have a significant impact on the Yellow-bellied Sheathtail-bat as it is considered likely that this species only visits this area for foraging habitat and does not rely on this area as a roosting site.

Habitat requirements for the Koala includes both wet and dry Eucalypt forest and woodland that contains canopy cover of approximately 10 to 70 per cent, with acceptable Eucalypt food trees. This habitat is absent within the study area and therefore there is no likelihood of occurrence of the Koala within the study area (refer to Annexure A of Appendix S (Technical working paper: Biodiversity) of the EIS).

Notwithstanding the unlikely impact to threatened fauna, environmental management measures have been identified to ensure the project does not impact threatened fauna (see **Chapter E1** (Environmental management measures)). In summary, these include:

- A CFFMP will be developed and implemented during construction (environmental management measure B1). The CFFMP will include the following related to impacts on threatened fauna:
  - Pre-disturbance inspection requirements to identify features of biodiversity conservation significance and select appropriate management measures and environmental controls
  - Management measures and environmental controls to be implemented before and during construction including an unexpected threatened species finds procedure
- Prior to the commencement of any works associated with the modification of the Victoria Road bridge, an inspection will be carried out by a suitably qualified and experienced ecologist to confirm the presence of roosting microbats. If roosting microbats are identified, measures to manage potential impacts will be developed in consultation with an appropriate microbat expert and included in the CFFMP prior to the commencement of any work with the potential to disturb the roosting locations (as confirmed by the microbat expert) (environmental management measure B2)
- The UDLPs will include compensatory planting for trees removed by the project. The plans will include species recommendations for the landscape design to consider, including foraging trees for the Grey-headed Flying-fox (environmental management measure OB9).

C18.4 Impacts on aquatic biodiversity

Three submitters raised concerns about impacts on aquatic biodiversity. Refer to section 18.3 of the EIS for details on potential loss of aquatic biodiversity.

C18.4.1 Impacts to aquatic biodiversity

Submitters raised concerns regarding the potential for the project to impact aquatic ecology including impacts to aquatic ecosystems located near the project footprint. In particular, submitters were concerned that tunnelling works near or underneath Whites Creek and Johnstons Creek may have impacts on these creeks and associated aquatic ecosystems, and have flow-on impacts on the biodiversity of Sydney Harbour.

Response

An assessment of impacts on aquatic biodiversity resulting from the project was undertaken as part of the EIS (refer to section 9.4.1 of Appendix S (Technical working paper: Biodiversity) of the EIS).The waterways located within the study area are highly modified environments, consisting of concrete lined walls, with limited ecological and aquatic habitat value. Riparian vegetation within the study area largely consists of planted and landscaped native and exotic species that does not contribute significantly to the ecological functioning of the waterways. The project would not directly impact marine vegetation or aquatic habitat of threatened species, communities or populations.

No impacts on aquatic biodiversity due to water quality are likely to occur as a result of the project. Appendix Q (Technical working paper: Surface water and flooding) of the EIS concluded that no adverse surface water quality impacts are anticipated with implementation of appropriate management measures as part of the project and the residual risk to the environment would be low.

There would be no net loss of aquatic habitat in the medium to long term as a result of the project. Accordingly, the project could meet the aquatic ecology conservation requirements of the *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005* under the EP&A Act. Riparian vegetation may need to be removed at Whites Creek however new riparian vegetation would be established during the Whites Creek naturalisation works by Sydney Water. No direct impacts would occur to Dobroyd Canal (Iron Cove Creek), Hawthorne Canal, Iron Cove estuary, Johnstons Creek and Alexandra Canal as the surface works either lie outside of the riparian buffer or is on developed land.

In the short term during construction, indirect impacts to waterways and aquatic habitat could occur if adequate controls are not in place, specifically to address ground disturbance and sediment runoff during construction, water discharged from tunnel dewatering and high velocity runoff/discharge. Uncontrolled runoff or discharge can influence the physico-chemical properties of waterways, such as water temperature, turbidity, pH, salinity and alkalinity and concentration of nutrients and toxicants within waterways. However, the receiving waterways are currently highly disturbed ecosystems with limited ecological habitat (due to human impact). Management measures would be implemented to minimise disturbance to waterways and ensure discharges are of suitable quality. Impacts to ambient water quality within Sydney Harbour were assessed to be negligible, with any localised minor impacts occurring within close proximity to the disturbance or discharge point.

During operation, the project would generally reduce the mean annual stormwater pollutant loads being discharged to receiving waterways when compared to the existing conditions.

The mainline tunnel is proposed to be constructed below Whites Creek at Annandale at a depth of around 39 metres below ground level and below Johnstons Creek near Parramatta Road at Stanmore at a depth of around 28 metres below ground level. In both cases the tunnels would be located in competent bedrock (Hawkesbury Sandstone) and predicted ground movement (settlement) is expected to be less than 20 millimetres, which would be consistent with the most stringent maximum settlement criteria proposed for the project (refer to section 12.3.4 of the EIS). Tunnelling beneath these locations is not anticipated to result in significant morphological changes for these watercourses that could impact on water quality and flows.

Both Whites Creek and Johnstons Creek are concrete lined, thereby limiting the hydraulic connection between surface water and groundwater. Seepage to groundwater is limited to water flowing through fractures within the concrete lining, and along unlined stretches or naturalised areas. Therefore the presence of tunnels below the creeks is unlikely to result in any significant changes to flows in these watercourses.

The upgrade of the existing bridge structure over Whites Creek would shade the aquatic habitat within the concrete channel of Whites Creek, creating less favourable conditions for barnacles and oysters attached to the wall. The increased bridge width is unlikely to act as a behavioural barrier to fish passage and is considered to have adequate clearance (about two to three metres above water), depth (about one to two metres) and width (about nine metres) to encourage fish movement.

It is considered unlikely that there would be valuable or specific aquatic habitat for threatened aquatic/estuarine species (including fish, sharks, rays, aquatic mammals and birds), populations or communities listed under the FM Act, TSC Act or EPBC Act present within the study area. As Whites Creek is concrete lined, it is not considered key fish habitat and does not receive a waterway crossing classification for fish passage in accordance with the *Fisheries Policy and Guidelines for Fish Habitat and Conservation Management – update 2013* (Fairfull 2013). It is possible some species may opportunistically pass near the study area at Whites Creek, given the connectivity to the broader harbour and coastal habitats, but those species are unlikely to depend on the habitat within Whites Creek. Similarly, Johnston Creek is concrete lined and does not have any valuable aquatic habitat mapped by DPI-Fisheries and the Sydney Harbour – Foreshores and Waterways Area Development Control Plan: Ecological Communities and Landscape Characters and Wetlands Protection Map (SHFWDCP).

During construction, the proposed works in Whites Creek, and adjacent to Rozelle Bay, may temporarily obstruct fish passage. This impact would be minimal given the poor creek habitat in Whites Creek and Rozelle Bay intertidal and subtidal area. Fish passage would be restored during operation.

Appropriate fish passage will be provided for crossings of fish habitat streams at Whites Creek. Erosion and sedimentation in adjacent aquatic environments to the project will be minimised through the implementation of site-specific Erosion and Sediment Control Plans (ESCPs) which would contain measures to stabilise all surfaces disturbed as a result of the project (see environmental management measures B4, SW03 and SW06 in **Chapter E1** (Environmental management measures)).

As part of the project, an upgraded culvert would be provided to discharge flows into Rozelle Bay from Easton Park, requiring the removal of about 27 metres of intertidal rock revetment wall. Environmental management measure OSW17 requires that new discharge outlets be designed with appropriate energy dissipation and scour protection measures as required to minimise the potential for sediment disturbance and resuspension in receiving waters (see **Chapter E1** (Environmental management measures)). Therefore, a rock spillway and scour protection rock apron or similar would replace the existing rock wall, providing a similar scale and type of intertidal habitat. This intertidal habitat is in poor condition and its modification would not result in a net loss of key fish habitat. No direct impacts would occur to Johnstons Creek.

C18.4.2 Impacts to ecological health of waterways from contaminated stormwater runoff

Submitters raised concerns that contaminated stormwater runoff would endanger the ecological health of the Easton Park drain, Whites Creek and ultimately Rozelle Bay.

Response

An assessment of impacts on aquatic biodiversity resulting from the project was undertaken as part of the EIS (refer to section 9.4.1 of Appendix S (Technical working paper: Biodiversity) of the EIS). As discussed in **section C18.4.1**, the waterways located within the study area are highly modified environments, consisting of concrete lined walls, with limited ecological and aquatic habitat value. An assessment of existing surface water quality indicated water quality issues at Easton Park drain, Whites Creek and Rozelle Bay including elevated levels of metals, and occasional exceedances of pH and turbidity guideline levels (refer to section 4.5 of Appendix Q (Technical working paper: Surface water and flooding) of the EIS).

Potential impacts on receiving waterways such as Rozelle Bay, from contaminated stormwater runoff, have been considered. The potential impacts will be managed through implementation of a Construction Surface Water Management Plan which will consider the potential for contaminated soils and surface water runoff and propose appropriate management measures to minimise the potential water quality impacts in receiving waters such as Rozelle Bay (see environmental management measures SW01 and SW02 in **Chapter E1** (Environmental management measures)). These measures will be implemented to protect nearby waterways at all construction ancillary facilities where surface works would be carried out. Discharges from the project during construction will be regulated by the NSW Environment Protection Authority through the project's Environment Protection Licence.

During operation of the project there is potential for increased stormwater runoff and associated increases in pollutant loading from roads. Rates of generation of pollutants from road surfaces (within above ground areas) were estimated from Model for Urban Stormwater Improvement Conceptualisation (MUSIC) modelling (refer to section 6.3 of Appendix Q (Technical working paper: Surface water and flooding) of the EIS). Stormwater pollutant loads generated by the project would be controlled by a stormwater quality treatment system, designed in accordance with the project stormwater quality objectives developed with consideration to the Sydney Harbour and Parramatta River catchment water quality objectives. MUSIC modelling was undertaken to assess the impact of the project and performance of the stormwater quality treatment measures. The modelling results for the main locations where water would be discharged (Rozelle Bay, Iron Cove, White Bay and Whites Creek) and for the project as a whole indicate that the project would generally reduce the mean annual stormwater pollutant loads being discharged to the five receiving waterways, when compared to the existing conditions.

C18.5 Groundwater dependent ecosystems

One submitter raised concerns about groundwater dependent ecosystems. Refer to section 18.3 of the EIS and section 4 of Appendix S (Technical working paper: Biodiversity) for an assessment on groundwater dependent ecosystems.

C18.5.1 Groundwater drawdown on vegetation

A submitter raised concerns with the impact on the broader ecological footprint, at Rozelle specifically, from the dewatering of the Hawkesbury Sandstone from tunnel excavations. The submitter was specifically concerned that this would result in significant vegetation stress and loss.

Response

Impacts of groundwater drawdown are discussed in section 9.4.2 of Appendix S (Technical working paper: Biodiversity) of the EIS. The most likely groundwater dependant ecosystem types in the Sydney region are terrestrial vegetation communities with deep roots that use groundwater, wetlands, and river baseflow systems. A search of the National Atlas of Groundwater Dependant Ecosystems (Bureau of Meteorology, accessed 27 September 2016) indicated that there are no ecosystems within the study area that are likely to be dependent on groundwater.

Long term dewatering caused by tunnel drainage would lower the water table and potentiometric heads within the Hawkesbury Sandstone, and could potentially reduce the amount of groundwater available for non-groundwater dependant shallow rooted plants. Within the Hawkesbury Sandstone across the Rozelle area, the standing water level is variable, ranging from about 0.5 metres to 15 metres below ground level. Consequently flora is unlikely to be completely dependent on groundwater. This would not change following the construction of the tunnels.

The groundwater levels measured within the deep palaeochannel (within the Rozelle Rail Yards) range from 1.11 metres Australian Height Datum (AHD) to 2.04 metres AHD. Groundwater drawdown within the palaeochannels and river alluvium within the project footprint, including beneath Rozelle Rail Yards, would be low because the tunnel sections that intersect the alluvium are to be constructed as undrained (tanked) tunnels. In addition, groundwater levels in this area may be partly maintained by direct hydraulic continuity with surface water.

C18.6 Cumulative biodiversity impacts

One submitter raised concerns about cumulative biodiversity impacts of the project. Refer to section 26.4 of the EIS for an assessment of cumulative biodiversity impacts.

C18.6.1 Cumulative biodiversity impacts

A submitter raised concerns regarding the cumulative impacts on biodiversity from various projects working in reasonable proximity to, and with similar timeframes as the M4-M5 Link. These impacts should be assessed in the EIS prior to approval. The projects referenced included:

- King Street Gateway
- Alexandria to Moore Park Connectivity Upgrade

- Parramatta Road bus rapid transit
- Parramatta light rail
- Johnston's Creek and Iron Cove Creek naturalisation
- Parramatta Road and Great North Road at Five Dock proposed intersection upgrade.

Response

Cumulative impacts on biodiversity from other WestConnex projects and other known or potential projects in the study area (which were selected for the cumulative impact assessment based on the methodology described in Appendix C (Cumulative impact assessment methodology) of the EIS) were assessed in section 9.6 of Appendix S (Technical working paper: Biodiversity) of the EIS. The assessment focused on cumulative biodiversity impacts associated with other WestConnex component projects:

- Rozelle Rail Yards site management works
- CBD and South East Light Rail– Rozelle maintenance depot
- Whites Creek naturalisation.

The assessment concluded that in total around 3.86 hectares of native vegetation would be impacted by the WestConnex program of works, which is not significant in the context of existing native vegetation across the Sydney Basin. A further 50.18 hectares of exotic and planted vegetation (mapped as 'urban exotic and native cover') would be removed and represents potential foraging habitat for the Grey-headed Flying-fox (total 53.49 hectares). Of this, up to 38.67 hectares has been identified as potential foraging habitat for the Eastern Bentwing-bat and Yellow-bellied Sheathtail-bat. Offset for individual trees would be integrated into the UDLPs for the individual projects, and would provide foraging habitat for species such as the Grey-headed Flying-fox and microbats. Therefore, the cumulative impacts to Grey-headed Flying-fox and the threatened microbats would not result in a significant impact. No camps or breeding sites would be impacted and the removal of potential feed trees and foraging habitat is negligible in the context of existing available foraging habitat for these species.

Table 1-2 in Appendix C (Cumulative impact assessment methodology) of the EIS provides a list of projects that were considered, but not assessed in the cumulative impact assessment and the justification for why they were not included.

The following projects were not assessed in the cumulative impact assessment due to the design of the projects being in early stages, there being insufficient public information available and impacts and the timing of the projects not yet being known:

- King Street Gateway
- Alexandria to Moore Park Connectivity Upgrade
- Parramatta Road bus rapid transit
- Parramatta light rail
- Johnstons Creek naturalisation.

The naturalisation of a section of Iron Cove Creek (also known as Dobroyd Canal) is currently being investigated by Sydney Water, which would involve revegetation within and adjacent to the creek channel. The section of the creek being investigated runs from Ramsay Street to Dobroyd Canal at Five Dock, and is about 90 metres north of the of the Wattle Street tunnel portal works (by M4 East) and Wattle street entry and exit ramp works (by M4-M5 Link). The naturalisation of Iron Cove Creek was not assessed in the cumulative impact assessment because it is still in early design stages and the impacts and timing of the project are not known.

The Parramatta Road and Great North Road intersection upgrade (part of the Roads and Maritime Pinch Points Program) is proposed to be constructed and completed in 2018 (Roads and Maritime 2016f). These works are located about 350 metres northwest of the Wattle Street and Parramatta Road intersection. A REF was undertaken for this intersection upgrade project and concluded that the works are not likely to significantly impact threatened species, populations or ecological communities or their habitats due to the site being highly modified, and no natural habitat or endemic flora being present (Roads and Maritime 2016f). Cumulative impacts on biodiversity from the Parramatta Road pinch point project and the M4-M5 Link are unlikely.

C18.7 Biodiversity environmental management measures

Three submitters raised concerns about the environmental management measures for biodiversity impacts. Refer to **Chapter E1** (Environmental management measures) for details on the biodiversity environmental management measures.

C18.7.1 Management measures and offsets

Submitters questioned the nature, adequacy and feasibility of the management measures to manage potential biodiversity impacts, including:

- An expert on the Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) should carry out further investigations to ascertain the disturbance and threat to their chosen habitat as a result of the construction works at Rozelle
- Recommend a tree inventory that would be accessible to the public to ensure the proposed number of trees are removed only
- Measures should be taken to save the loss of birds and trees. Any clearing of weedy small bird habitat from Rozelle Rail Yards should be staged to maintain transitional habitat for small birds during construction for adaptive/survival purposes. Cleared areas should be replaced with new native vegetation areas of equivalent size, to provide adequate habitat compensation for locally vulnerable species such as small birds
- Efforts should be made to retain existing, valuable pockets of native vegetation throughout the Rozelle Rail Yards site and to use this vegetation as sources for propagation and progressive re-vegetation of new open space areas within and adjacent to the site. This is in keeping with the Greenway recommendation 4.2.

Response

Potential impacts of the project on the Eastern Bentwing-bat is provided in **section C18.3.1**.

Prior to the commencement of any works associated with the modification of the Victoria Road bridge, an inspection will be carried out by a suitably qualified and experienced ecologist to confirm the presence of roosting microbats, in accordance with environmental management measure B2 (see **Chapter E1** (Environmental management measures)). If roosting microbats are identified, measures to manage potential impacts will be developed in consultation with an appropriate microbat expert and included in the CFFMP prior to the commencement of any work with the potential to disturb the roosting locations (as confirmed by the microbat expert).

The investigation of trees to be removed as part of the project (refer to Annexure A of Appendix S (Technical working paper: Biodiversity) of the EIS) was based on the current project footprint and concept design for the project. During detailed design, further opportunities to retain trees may emerge. However, where retention of trees is not possible, compensatory planting will be carried out with replacement trees planted within or close to the project footprint where feasible and practical, in accordance with environmental management measure B6 in **Chapter E1** (Environmental management measures). In addition, protection of trees on project sites will be carried out in consultation with a qualified arborist and tree removal, pruning and maintenance work will be carried out by a qualified arborist (see environmental management measures B7 and B8 in **Chapter E1** (Environmental management measures)). Replacement trees will be included in the relevant UDLPs. UDLPs will be prepared in consultation with local communities and relevant local councils.

As discussed in **section C18.2.1**, the majority of vegetation clearing, including weed removal, at the Rozelle Rail Yards is being undertaken as part of the Rozelle Rail Yards site management works. The site management works were subject to a separate environmental assessment in a REF which was approved by Roads and Maritime under Part 5 of the EP&A Act in April 2017. As required by the REF, a staged approach is being used for the removal of vegetation at the site, with a break between the clearing stages.

The likelihood of impacts on birds as a result of loss of trees is limited due to the high mobility of birds, allowing them to move to similar habitat in the locality and accessing replacement trees planted as part of the project. Notwithstanding this, the CFFMP to be developed and implemented during construction of the project, will include pre-disturbance inspection requirements to identify features of biodiversity conservation significance and select appropriate management measures and environment controls (see environmental management measure B7 in **Chapter E1** (Environmental management measures)).

In addition, as many trees as possible will be retained during construction and in the event that tree removal cannot be avoided, a tree replacement strategy will be prepared (see environmental management measure B6 in **Chapter E1** (Environmental management measures)). The project will also deliver up to 10 hectares of open space at the Rozelle Rail Yards, which will provide a significant opportunity for replacement tree planting. This is discussed further in **section C18.2.1**.

C19 Groundwater

This chapter addresses issues raised in community submissions associated with the groundwater assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 19 (Groundwater) and Appendix T (Technical working paper: Groundwater) of the EIS for the further details on the groundwater assessment.

Contents

C19.1 Level and quality of groundwater assessment

38 submitters raised concerns about the quality of the groundwater assessment. Refer to section 19.1 of the EIS and Appendix T (Technical working paper: Groundwater) for details of the groundwater assessment methodology.

C19.1.1 Inadequate information in the EIS on groundwater impacts

Submitters expressed concern that the EIS contains uncertainties and little information on the impact of the project on groundwater and therefore it does not meet the standards of an EIS. Specific concerns included:

- The EIS does not address the impacts to groundwater, provides little information and should not be accepted as an EIS
- There is no evidence that the tunnels have been carefully designed to avoid groundwater contamination
- The lack of detailed design for the Rozelle interchange makes it impossible for the NSW Department of Planning and Environment (DP&E) to assess whether the tunnels will have an impact on the mobilisation of contaminants in groundwater and/or prevent contaminated groundwater flow. To approve a proposal with identified risks that has so little project detail or mitigation information jeopardises the health of Sydney residents and adds to ecological risks, particularly at Rozelle
- The water quality results that are contained in Appendix T do not include an interpretive analysis of each identified contaminant with no explanation for measured change in analytical results.

Response

A groundwater assessment to support the EIS has been undertaken to address the Secretary's Environmental Assessment Requirements (SEARs) relevant to groundwater. The assessment presented in the EIS includes:

- Consideration of the existing environment that the project would interact with, including the hydrogeological conditions and environmental values of the surrounding environment
- An impact assessment, which characterises the impacts of the tunnels on groundwater and environmental features that interact with groundwater using numerical modelling techniques to quantify impacts
- Groundwater management and monitoring measures required to mitigate impacts and manage tunnel inflows.

Groundwater samples were collected from monitoring wells across the groundwater assessment study area and were tested and analysed to characterise the local groundwater levels and quality. A three-dimensional numerical groundwater model was developed to simulate existing groundwater conditions and the effects of proposed tunnel alignments, caverns and associated subsurface ancillary infrastructure. The groundwater model was used to predict future groundwater conditions and potential impacts related to the project. The groundwater model was prepared by an independent specialist, HydroSimulations, and was peer reviewed in accordance with Australian Groundwater Modelling Guidelines (Barnett *et al* 2012) by an independent peer reviewer engaged by Sydney Motorway Corporation (SMC). It was also reviewed by the Roads Maritime Environment Branch. An independent peer review of the report is also being undertaken on behalf of DP&E. Although the EIS is based on a concept design, the model is conservative in nature and includes an assessment of all elements of the project, including the mainline tunnels and the Rozelle interchange. As a result it is considered to provide a good estimate of likely groundwater impacts. Any substantial departure from the concept design in the EIS would be subject to further assessment.

During the geotechnical and hydrogeological field investigations a network of 58 monitoring wells were established along the alignment between May 2016 and May 2017. The monitoring wells were constructed to monitor groundwater within the geological formations intersected by the tunnel alignments including alluvium, Ashfield Shale, Mittagong Formation and Hawkesbury Sandstone. At some locations nested wells were constructed monitoring groundwater from the alluvium and underlying Hawkesbury Sandstone. The wells have been regularly monitored at monthly intervals for groundwater levels and quality commencing in June 2016 and the results have been used to inform the development of the groundwater model.

Appendix T (Technical working paper: Groundwater) of the EIS outlines how groundwater was sampled and analysed to characterise the local groundwater quality. Routine groundwater samples were tested for several components including major ions, metals, nutrients and sulfate reducing bacteria. This was used to create a baseline for the existing groundwater quality within the study area. Groundwater levels are also monitored on a monthly basis with groundwater levels also being recorded automatically on an hourly basis in data loggers in most monitoring wells.

Groundwater contamination monitoring was conducted in September and November 2016 to support the site contamination investigations. The groundwater contamination sampling was targeted based on an assessment of previous and current land usage. The contamination analytical suite included hydrocarbons (total recoverable hydrocarbons (TRH), naphthalene, benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH)), volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs) including herbicides and pesticides. Groundwater assessment criteria were developed in accordance with relevant guidelines to inform what levels of these components are appropriate for discharge into the receiving environment, in order to inform the groundwater treatment required.

Potential construction and operation impacts were identified through the assessment and are considered in sections 19.3 and 19.4 of the EIS. These include several aspects such as reduced water recharge, tunnel inflow, groundwater level decline, groundwater quality, ground movement and groundwater balance.

Potential impacts to the local community from the mobilisation of contaminated groundwater are described in Chapter 16 (Contamination) of the EIS and are also discussed in **section C19.3.1**. Areas within and along the project footprint that may contain contaminated soil and/or groundwater due to past or present land use practices have been investigated. A potential contamination risk identified in the EIS includes the migration of contaminated groundwater plumes towards the tunnels due to the potential groundwater contamination located in the area.

Potential groundwater contamination impacts would be monitored prior to and during construction in the groundwater monitoring network established for the project.

The development of management measures to minimise impacts on groundwater were developed from the outcomes of the assessment and include undertaking further modelling prior to construction and the development and implementation of a groundwater monitoring program (see **Chapter E1** (Environmental management measures). Measures also provide commitments about the design of the tunnels, including:

- Groundwater inflows within the tunnels will be minimised by designing the final tunnel alignment to minimise intersections with known palaeochannels and alluvium present in the project footprint (such as at Rozelle), identified during geotechnical investigations
- Appropriate waterproofing measures will be identified and included in the detailed design to permanently reduce, where feasible and reasonable, the inflow into the tunnels to below one litre per second per kilometre for any kilometre length of the tunnel
- Appropriate measures will be investigated and implemented at dive structures and shafts and for cut-and-cover sections of the tunnel to minimise groundwater inflow
- A detailed groundwater model will be developed by the design and construction contractor(s) during detailed design that will be used during construction using additional data collected during the construction program to refine model predictions as required.

Groundwater investigations to date have indicated that the majority of groundwater contamination is likely to be within the shallow unconfined alluvium such as at the Rozelle Rail Yards. Tunnel sections intersecting the alluvium at the Rozelle Rail Yards are to be undrained (tanked) so any contaminated groundwater is not drawn directly into the tunnel or mobilised. Any captured contaminated groundwater through tunnel inflows will be treated in water treatment plants proposed at the Rozelle motorway operations complexes (MOC2 and MOC3) and the Darley Road motorway operations complex (MOC1) at Leichhardt. During the operational phase of tunnel inflow, groundwater quality will be routinely monitored to detect any water quality changes and treated as required prior to discharge where it meets the discharge criteria, or otherwise collected for disposal.

C19.1.2 Groundwater modelling

Submitters raised concerns about modelling of groundwater. Specific concerns include:

- Concern that despite the predicted permanent decline of groundwater levels, there is no modelling and assessment on the local impact of settlement due to groundwater withdrawal
- Concern that requirement 10(b) of the SEARs; 'impacts from any permanent and temporary interruption of groundwater flow, including then extent of drawdown and the potential for settlement' was not addressed by the EIS. The submitter states that localised modelling should be undertaken at the EIS stage instead of later by the construction contractor
- A submitter also suggested that the EIS has not modelled the localised impact of settlement resulting from groundwater withdrawal, based on this sentence on page 19-39 of the EIS: 'the model is a regional groundwater model and is not considered appropriate for use in estimating groundwater induced settlement at a more localised level'.

Response

Ground settlement due to groundwater drawdown is discussed in section 19.3.8 and section 12.3.4 of the EIS. The preliminary assessment does not include prediction of settlement as a result of groundwater drawdown (consolidation settlement). In contrast to predicting tunnel excavation-induced ground movement, which has a well-documented and accepted methodology, prediction of consolidation settlement relies on the prediction of induced groundwater drawdown, which is complex and subject to significant uncertainties.

Settlement that occurs due to groundwater drawdown is gradual and generally occurs at a slow rate (possibly over years). It can sometimes be difficult to distinguish from settlement due to groundwater drawdown that may be naturally occurring or occurring due to seasonal variations which cause swelling or shrinkage of the soil. The extent of groundwater drawdown often occurs over a wider area beyond the location of the tunnels and results in a wider and shallower settlement trough. As a result settlement from groundwater drawdown is less likely to result in differential settlement which causes tensile strain on buildings and building damage.

Cumulative settlement impacts include the combined impacts of settlement from tunnel excavation induced ground movement and groundwater drawdown. Tunnel excavation induced ground movement is anticipated to be the prevalent mechanism causing ground movement given that the proposed tunnels are primarily located within competent bedrock (Hawkesbury Sandstone and Ashfield Shale).

The risks associated with groundwater drawdown and induced settlement within the Ashfield Shale and Hawkesbury Sandstone would be low because of the geotechnical properties of the rock. As water is removed from these rock types the structural integrity and strength of the rock remains due to its competent nature. Residual soil profiles developed on the weathered sandstone and shale bedrock are typically relatively thin, stiff and of low compressibility and as such would be less susceptible to ground settlement groundwater drawdown. As a result, settlement impacts due to groundwater drawdown are not anticipated to occur for tunnels excavated in the Hawkesbury Sandstone or Ashfield Shale.

In contrast, as groundwater drawdown occurs within alluvium (as found in parts of Rozelle), the structural integrity of the unconsolidated sediment is compromised, resulting in more settlement than would be expected from the sandstone and shale. Since ground settlement is more likely to occur within the alluvium where tunnels are constructed, design measures have been instigated to minimise groundwater drawdown induced settlement at those locations. Where alluvium is intersected the tunnels would be tanked to minimise groundwater ingress and associated groundwater drawdown and

settlement above the tunnel. In addition, beneath Hawthorne Canal and Johnstons Creek, the tunnels have been designed to dive beneath the alluvium to reduce groundwater ingress to the tunnels.

The regional groundwater model is not considered appropriate for use in estimating groundwater induced settlement at a more localised level. Prediction of consolidation settlement relies on the prediction of induced groundwater drawdown, which is complex and subject to significant uncertainties. As described above, settlement that occurs due to groundwater drawdown is gradual and generally occurs at a slow rate and over a wide area which minimises the potential for differential settlement and the associated risk to damage to buildings. A preliminary assessment based on geotechnical conditions has been carried out to assess the potential for ground movement as a result of the project.

A detailed groundwater model is to be developed by the design and construction contractor during detailed design to predict groundwater inflow rates and volumes within the tunnels and groundwater levels (including drawdown) in adjacent areas during construction and operation of the project (see environmental management measure GW7 in **Chapter E1** (Environmental management measures)). Further assessment of potential settlement impacts, including numerical modelling, will be undertaken during detailed design (see environmental management measure PL7 in **Chapter E1** (Environmental management measures)).

Building condition surveys of potentially impacted property and infrastructure would be undertaken before the commencement of construction activities that would pose a settlement risk, to determine appropriate settlement criteria to prevent damage. In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified in a timely manner. See **section C12.5** for further information regarding potential settlement impacts to property.

Settlement monitoring will be undertaken during construction and operation at properties and infrastructure where exceedances of the settlement criteria are predicted. Settlement monitoring may include the installation of settlement markers or inclinometers. In the event that damage occurs to properties or infrastructure due to settlement during operation of the project, measures will be taken to 'make good' the impact (see **Chapter E1** (Environmental management measures)).

C19.2 Tunnel inflow and groundwater level decline

39 submitters raised concerns about the tunnel inflow and groundwater level decline. Refer to section 19.3 and 19.4 of the EIS for details of tunnel inflow and groundwater level decline.

C19.2.1 Groundwater impacts and treatment in tunnels

Submitters were concerned that there is a potential for impacts on groundwater from tunnelling activities. Specific concerns included:

- Impacts from changed soil moisture content (including property damage). Submitters noted that the EIS acknowledges that moisture drawdown (groundwater drawdown) caused by tunnelling activities will occur
- Estimates of groundwater generation rates in tunnels do not provide sufficient information to determine measures required to protect the environment
- The proposed sizing and performance of tunnel treatment to reduce infiltration is not clearly stated
- Rozelle interchange will impact the water table.

Response

Changes in soil moisture can result in ground movement and associated damage to buildings and structures. Ground movement due to soil moisture depletion caused by tunnel leakage is a long term effect as groundwater drawdown extends outwards from the tunnel. Some settlement occurs naturally in soils as groundwater and soil moisture levels fluctuate due to climatic variation. Areas most affected by soil moisture depletion are those where there are deeper alluvial soils present such as the Rozelle Rail Yards. At the Rozelle Rail Yards and other areas where there are deep soils the tunnels are designed to be either undrained (tanked) or dive beneath the alluvium such as the palaeochannel at Hawthorne Canal. This approach is designed to minimise groundwater depletion from deeper alluvial soils. In addition, there is little major infrastructure designed on these deeper alluvial soils mainly because they are known to be geotechnically unstable.

Potential construction and operation impacts due to groundwater drawdown as a result of tunnelling activities is discussed in section 19.3.3 and 19.4.3 of the EIS. Groundwater level drawdown was predicted by groundwater modelling as part of the EIS and the key findings for the operational phase of the project were:

- After the commencement of operations in 2023 the estimated long term inflows to the motorway tunnels are predicted to be 0.47 litres per second per kilometre initially, reducing to 0.25 litres per second per kilometre in 2100
- The predicted long term tunnel inflow or 'take' (from the combined motorway tunnels and ventilation tunnels) is estimated to vary from 1.74 megalitres per day (635.1 megalitres per year) in 2023, reducing to 0.99 megalitres per day (361.4 megalitres per year) in 2100
- The predicted long term tunnel inflows represent a small percentage of the Long Term Average Annual Extraction Limit (LTAAEL) as outlined in the water sharing plan for the Sydney Basin Central, which range from 0.7 per cent to 1.3 per cent.

During stakeholder consultation on the EIS, Department of Primary Industries – Water (DPI-Water) advised that the predicted amount of groundwater take is available and thus the proposed level of extraction should not pose a threat to the environment.

These predictions will be refined during construction in a similar model to be updated by the design and construction contractor(s). Management measures include a groundwater monitoring program during construction and the operations phases and measures to 'make good' any impacts on impacted water supply bores by restoring the water supply to pre-development levels.

The veracity of the groundwater modelling undertaken for the EIS is discussed in **section C19.1** and is considered adequate to inform the management measures to minimise risks of potential impacts. Conservative estimates of tunnel inflows were made by assuming a maximum groundwater inflow rate of one litre per second per kilometre along the whole drained tunnel length during operation of the project, although inflow rates in some sections of the tunnels would be less than the maximum allowed rate.

Management measures include minimising groundwater inflows within the tunnels by designing the alignment to minimise intersecting known palaeochannels and alluvium present in the project footprint, and implementing appropriate waterproofing. At the Rozelle Rail Yards, tunnels intersecting the alluvium would be fully lined to prevent direct inflow of groundwater from the alluvium. The detailed groundwater model developed prior to construction will be used to predict groundwater inflow rates and volumes to meet the required performance criteria (see **Chapter E1** (Environment mitigation measures)).

Groundwater tunnel inflows would be reduced during construction by waterproofing measures such as grout injection, pressure cementing or pre-grouting to reduce the bulk hydraulic conductivity and hence inflows. The installation of geofabric liners or membranes is also an option to control groundwater inflows. At cut and cover sections groundwater inflows will be controlled by the installation of cut-off walls. The volume of groundwater and treatment requirements would differ depending on the tunnel depth and the geological units through which it passes. Groundwater treatment is discussed in section 19.3.4 of the EIS.

During construction, the wastewater generated in the tunnel (including collected groundwater) would be captured, tested and treated at a construction water treatment plant (if required) prior to reuse or discharge, off-site as required.

During operation, treated groundwater flows from the Rozelle water treatment plant would drain via a constructed wetland to Rozelle Bay. Treated flows from the Darley Road water treatment plant would be discharged to Hawthorne Canal. A small portion (around 1.6 kilometres) of M4-M5 Link tunnel would also drain to the New M5 operational water treatment plant at Arncliffe. Operational water discharge criteria would be developed in accordance with ANZECC (2000) and with consideration of the relevant NSW Water Quality Objectives (WQOs) and in consultation with relevant agencies including the NSW Environment Protection Authority (NSW EPA), DPI-Water and local councils.

C19.3 Groundwater quality

Nine submitters raised concerns about groundwater quality impacts of the project. Refer to section 19.3 and section 19.4 of the EIS and Chapters 5 and 6 of Appendix T (Technical working paper: Groundwater) of the EIS for an assessment of groundwater quality impacts.

C19.3.1 Contamination

Submitters were concerned about contamination of groundwater and the mobilisation of existing contaminated groundwater. Specific concerns included:

- That there is a potential for toxic pollutants to be leached from the project to the local groundwater
- Concern that at Rozelle, and specifically at Easton Park, there is a risk for contaminated groundwater to be exposed
- There is no evidence that the tunnels have been designed to avoid groundwater contamination
- Contaminated groundwater and saltwater intrusion has not been quantified
- In relation to the management of groundwater pollution, that the Alexandria Landfill exercise will be repeated and residents will be subject to offensive odours
- There is a potential for groundwater contamination at the Rozelle civil and tunnel site, as the soils present were found to include lead, arsenic, cadmium and zinc
- Contamination of groundwater is known to be present, widespread and likely to be exposed
- Construction has the potential to pollute the underground stream under Springside Street.

Response

Groundwater quality risks from construction activities include the potential to contaminate groundwater from fuel, oil or other chemical spills; and intercepting contaminated groundwater during tunnelling. There is also potential to intersect acid sulfate soils. Known contaminants within soils at the Rozelle Rail Yards could be mobilised by altered groundwater flow paths. As required by environmental management measure GW9, a groundwater monitoring program will be prepared and implemented to monitor groundwater inflows in the tunnels and groundwater levels as well as groundwater quality in the three main aquifers and inflows during construction. The program will identify groundwater monitoring locations, performance criteria in relation to groundwater inflow and levels and potential remedial actions that will be considered to address any non-compliances with performance criteria. As a minimum, the program will include manual groundwater level and quality monitoring monthly and inflow volumes and quality weekly (see **Chapter E1** (Environmental management measures)). Potential impacts on water quality as a result of mobilisation of contaminants are discussed in Chapter 16 (Contamination) of the EIS. This includes the management of odorous materials.

The primary risk to groundwater quality due to the project is the migration of contaminated groundwater along altered groundwater flow paths due to the tunnel construction. This risk is present throughout the project footprint, including at the Iron Cove Link (near Springside Street). At the Rozelle Rail Yards, groundwater beneath the site within the alluvium is shallow and impacted by historical industrial land uses. Potential contaminants of concern include heavy metals (arsenic, cadmium, copper, lead, nickel and zinc) and hydrocarbons. Tunnel sections through the alluvium would be constructed as undrained (tanked), and cut-off walls would be installed at tunnel portals and cut-and-cover sections to reduce the ingress of groundwater from the palaeochannels, minimising potential contaminated groundwater migration and addressing the requirements of DPI-Water. Since the majority of the tunnels are constructed within the Hawkesbury Sandstone at depths in excess of 20

metres and given the location of the tunnel in relation to the contaminant sources, the risk of intercepting contaminated groundwater is considered to be low.

As summarised in Chapter 15 (Groundwater) and Appendix T (Technical working paper: Groundwater) of the EIS, some saltwater intrusion from tidal areas towards tunnels is expected to occur over time. Capture zone analysis using particle tracking was used to provide an indication of areas where saltwater intrusion may occur and areas where the groundwater resources may be impacted as part of the modelling reported by Hydrosimulations (2017). Saltwater intrusion is not expected to be a significant environmental impact for a number of reasons including:

- There are no sensitive receptors (registered groundwater users or groundwater dependent ecosystems) in the vicinity of the tidal waterways or discharge treatment locations
- Areas where saline waters are expected to pass between tidal water bodies and the tunnels are within the tidal fringe which is already naturally saline due to tidal mixing
- Average times for water originating in tidal watercourses to reach the tunnels are predicted to be more than 100 years and maximum times are in the order of thousands of years. As a result, groundwater quality in the tunnel catchment zones would slowly become more saline over thousands of years. Since the operational lifetime for major infrastructure is in the order of 100 years, the slow salinity increase should have minimal impacts on the tunnels and infrastructure in the project's operational lifetime
- Groundwater use between the foreshore and tunnels is limited because the groundwater is typically saline and there is a reticulated water supply provided by Sydney Water. For these reasons the beneficial use of groundwater in the project footprint is unlikely to change due to an increase in salinity.

All groundwater captured during construction would be directed to water treatment plants, and contaminants would be removed prior to discharge or disposed of at a licensed facility in circumstances where contaminated water cannot be treated appropriately. During operation, groundwater inflows will be treated at water treatment plants located at motorway operations complexes at Darley Road at Leichhardt and Rozelle, to meet acceptable discharge criteria before being discharged to Hawthorne Canal and Rozelle Bay respectively. A groundwater monitoring program will be prepared and implemented during construction and operation to monitor groundwater quality in the three main aquifers and inflows. The monitoring program will be developed in consultation with relevant government agencies.

The contamination assessment (refer to Appendix R (Technical working paper: Contamination) of the EIS) identified that a number of the construction ancillary facilities were of medium and high contamination risk and these sites were recommended as requiring further intrusive site investigations. The additional site investigations may identify further groundwater contamination issues that will need to be managed.

Management measures will be implemented to appropriately store hazardous goods and potentially contaminating substances and reduce the potential for environmental contamination due to spills and leaks (see **Chapter E1** (Environmental management measures)). The risks to groundwater as a result of such incidents would be managed through standard construction management procedures in accordance with a construction environment management plan for the project. Further, emergency spill kits would be available on site during construction and staff would be trained in their use. All liquid dangerous goods and hazardous chemicals would be stored within a bunded storage container or spill tray within the construction ancillary facilities. Where possible, refuelling of vehicles or plant equipment would take place on hardstand or bunded areas.

C19.4 Cumulative groundwater impacts

One submitter raised concerns about cumulative groundwater impacts of the project. Refer to section 26.4 of the EIS and Chapter 7 of Appendix T (Technical working paper: Groundwater) of the EIS for an assessment of cumulative groundwater impacts.

C19.4.1 Cumulative impacts with Western Harbour Tunnel

A submitter was concerned that the Western Harbour Tunnel project has the potential to cause cumulative groundwater impacts with the M4-M5 Link project in the Rozelle area. The submitter noted that while cumulative groundwater impacts should be addressed in the future as part of the EIS for the Western Harbour Tunnel project, Rozelle is in a floodplain and should therefore be assessed now.

Response

The groundwater model has been used to quantify cumulative impacts of existing road tunnel projects and the WestConnex component projects (including the existing M5 East, New M5, M4 East and M4-M5 Link) on the hydrogeological regime (refer to Chapter 7 of Appendix T (Technical working paper: Groundwater) of the EIS). In addition, the cumulative impacts of other projects such as the proposed future Western Harbour Tunnel and Beaches Link program of works have been qualitatively assessed. Quantitative assessment was not possible at the time of the EIS as details of these projects, such as tunnel alignment, construction program and construction technique, were not available.

The proposed future Western Harbour Tunnel and Beaches Link program of works would include tunnelling which is likely to impact groundwater during the construction and operation phases. The M4-M5 Link project would construct tunnels and entry ramps that would link the Rozelle interchange with the proposed future Western Harbour Tunnel. These link structures have been included in the groundwater model and are assessed as part of the construction of the M4-M5 Link.

As the Rozelle Rail Yards are located within a floodplain and are underlain by alluvium, the tunnels constructed within the alluvium would be constructed as undrained (tanked) tunnels to prevent direct groundwater ingress into the tunnels. Most of the Rozelle interchange and the tunnels that link to the Western Harbour Tunnel would be excavated within the Hawkesbury Sandstone, a competent rock with geotechnical engineering properties suited to tunnelling. The sandstone has a lower bulk hydraulic conductivity than the alluvium, restricting potential groundwater ingress to the tunnels. The parts of Rozelle that are in a floodplain have therefore been assessed in the EIS for the M4-M5 Link project.

At the time of preparing the M4-M5 Link EIS and the groundwater model there was insufficient project details available regarding the alignment, construction program and construction techniques for the proposed future Western Harbour Tunnel and Beaches Link to enable an assessment of potential cumulative groundwater impacts. The proposed future Western Harbour Tunnel and Beaches Link program of works will be subject to separate environmental impact assessments and it is expected that their EISs would include a cumulative impact assessment of potential impacts to groundwater as a result of other projects, including the M4-M5 Link.

C19.5 Groundwater assessment environmental management measures

Three submitters raised concerns about the environmental management measures for groundwater impacts. See **Chapter E1** (Environmental management measures) for a summary of the environmental management measures.

C19.5.1 Groundwater monitoring network to assess groundwater contamination

A submitter noted that the EIS states that no groundwater monitoring wells have been installed specifically for the purposes of monitoring. The submitter requested that a measure regarding monitoring of groundwater contamination be included.

Response

As part of the groundwater assessment, a groundwater monitoring network was developed, including the conversion of 58 boreholes to monitoring wells throughout the project footprint. The monitoring network has provided baseline information about existing groundwater conditions (groundwater levels and quality) in the vicinity of the project footprint.

A groundwater monitoring program will be prepared and implemented to monitor groundwater inflows to the tunnels and groundwater levels and quality in the three main aquifers during construction. The program will identify groundwater monitoring locations, performance criteria in relation to groundwater inflows and levels and potential remedial actions that will be considered to address any non-compliance with performance criteria. As a minimum the program will include manual groundwater level and quality monitoring monthly and inflow volumes and quality weekly. The monitoring program will be developed in consultation with the NSW EPA, NSW Department of Primary Industries (DPI-Fisheries and DPI-Water) and the relevant councils.

The groundwater monitoring program prepared and implemented during construction will be augmented and continued during the operational phase. Groundwater will be monitored during the operational phase for three years or as otherwise required by the project conditions of approval and the program will include trigger levels for response or remedial action based on monitoring results and relevant performance criteria (see **Chapter E1** (Environment management measures)).

C19.5.2 Reduction in groundwater flow to Whites Creek

A submitter was concerned that there will be a 60 per cent reduction in groundwater contribution into Whites Creek and that this will impact on the ecosystem. Options should be considered to minimise the reduction in groundwater flow.

Response

Potential impacts on surface water and baseflow are discussed in section 19.3.3 of the EIS.

Predicted impacts of construction on baseflow for major watercourses have been modelled. For the purposes of modelling, baseflow is considered to be the groundwater that discharges to the creek and is simulated in the model only when groundwater reaches the ground surface and enters the drainage system. The baseflow component is small in terms of volume of water because it only occurs after large rainfall events sufficient to locally raise the groundwater to ground level. Groundwater contributions to baseflow are also limited as the creeks are concrete lined.

The majority of stream flow would be derived from stormwater runoff entering the drainage system rather than groundwater baseflow. Thus the overall contribution of groundwater baseflow as a percentage of total flow is small because:

- The concrete lining of creeks such as Whites Creek restrict groundwater inflows to the creek
- The lower reaches of the creeks are tidally influenced with equal volumes of groundwater recharging and discharging the creeks during the tidal cycle
- The catchments are heavily urbanised resulting in surface water run-off being directed into stormwater drains reducing natural groundwater recharge.

Therefore, groundwater drawdown under Whites Creek due to the project is not considered likely to significantly alter flows in the ecosystem of the waterway.

C19.5.3 Environmental management measures

Submitters were concerned about the groundwater mitigation measures. Specific concerns included:

- Groundwater and fire sprinkler water treatment has not been identified
- Specific details of parameters are required to design and reduce risk of an inadequate water treatment plant
- There is little detail on mitigation of mobilisation of contaminated groundwater.

Response

Operational impacts on water quality are discussed in section 15.4.2 of the EIS. The drainage infrastructure would be designed to accommodate groundwater ingress, stormwater ingress at portals, tunnel wash-down water and fire suppressant deluge water. The tunnels would include two separate tunnel drainage systems including one system to capture groundwater and the other to deal with any other drainage from the tunnel (including spills etc). The groundwater drainage stream is expected to produce flows containing a variety of pollutants that require treatment before discharge to manage potential impacts on the receiving environment. Tunnel wastewater would be pumped to water treatment facilities at the Darley Road motorway operations complex (MOC1) at Leichhardt and the Rozelle East motorway operations complex (MOC3) at Rozelle.

Elevated metals and nutrients were recorded during groundwater sampling and groundwater was identified as brackish. Metal, nutrient and ammonia loading to Hawthorne Canal and Rozelle Bay is likely to increase as a result of the continuous treated groundwater discharges. To prevent adverse impacts on downstream water quality within Rozelle Bay and Hawthorne Canal, water treatment plants would be designed so that tunnel wastewater would be of suitable quality for discharge to the receiving environment. For further discussion of potential impacts to downstream water quality as a result of discharges from the water treatment plants (see **section B5.3.2**). Groundwater quality will be monitored throughout construction and operation in accordance with a groundwater monitoring program developed in consultation with relevant stakeholders including NSW EPA, DPI-Water and local councils.

Temporary construction water treatment plants would be located at each construction ancillary facility where tunnelling would occur, and would be designed to treat construction water and groundwater inflows encountered during construction. See **section C15.3** for further details on water quality management.

The migration of contaminated groundwater due to altered flow paths from tunnel construction will be mitigated through the design and construction of undrained (tanked) tunnels to avoid the ingress of groundwater from palaeochannels at Whites Creek or the diving of the tunnels beneath the palaeochannels such as at Hawthorne Canal. Further discussion of issues associated with potential mobilisation of contaminated groundwater is contained in **section C19.3**.

Potentially contaminated areas directly affected by the project will be subject to further investigation and management in accordance with the relevant requirements of guidance endorsed under section 105 of the *Contaminated Land Management Act 1997* (NSW). If contamination posing a risk to human or ecological receptors is identified, a Remediation Action Plan will be prepared. Mitigation measures to avoid impacts due to the mobilisation of contaminated groundwater are described in **Chapter E1** (Environmental management measures).

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C20 Non-Aboriginal heritage

This chapter addresses issues raised in community submissions associated with the non-Aboriginal heritage assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 20 (Non-Aboriginal heritage) and Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS for the further details on the non-Aboriginal heritage assessment.

Contents

C20.1 Level and quality of the non-Aboriginal heritage assessment

549 submitters raised concerns about the quality of the non-Aboriginal heritage assessment. Refer to section 20.1 and Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS for details of the non-Aboriginal heritage assessment methodology.

C20.1.1 Adequacy of the non-Aboriginal heritage assessment

Concerns were raised that the EIS does not appropriately assess the impacts on non-Aboriginal heritage items including areas associated with the project.

Submitters specifically raised concern over the lack of assessment of the impacts of tunnelling (including noise and vibration) on non-Aboriginal heritage items located above the tunnels, particularly in areas such as Newtown and Rozelle. Other specific concerns include:

- There should have been a full report on all heritage buildings within the tunnel project boundaries
- Concern that there are no areas of disturbance and Historical Archaeological Management Units (HAMUs) identified in the City of Sydney Local Government Area (LGA)
- The number of heritage houses in the Rozelle interchange construction zone has not been specifically addressed
- Industrial heritage issues were not addressed in the EIS, nor was the heritage of the built environment of Bignell Lane
- Insufficient research of the impact on White Bay Power Station and request for excavation details at the site
- The EIS does not adequately assess the impacts on the historic Yasmar Estate
- Insufficient and inadequate research of the archaeology of the Rozelle Rail Yards
- The assessment does not address the cumulative impacts on heritage from the WestConnex program of works
- The methodology used is simply to describe heritage
- Objection to the approach of removing items that are within the project footprint and justification of removal of buildings by salvaging other items
- Older, historic inner suburbs and low-lying foreshore areas have been ignored
- The heritage report downplays potential impacts on hundreds of homes from Newtown to Annandale and Rozelle
- The impact on key high level heritage protection areas and sites in Newtown with a significant number of heritage protected buildings in the project's footprint not quantified.

Response

Adequacy of assessment

A robust heritage impact assessment was undertaken for the project in accordance with key guidelines and policies relevant to heritage management in NSW including the NSW heritage criteria set out in *Assessing Heritage Significance, NSW Heritage Manual* (Heritage Council of NSW 2002) and *Assessing Heritage Significance for Historical Archaeological Sites and 'Relics'* (Heritage Branch of the NSW Department of Planning 2009).

The non-Aboriginal heritage assessment (refer to Appendix U (Technical working paper: Non-Aboriginal) of the EIS) was prepared in accordance with the requirements of the *Heritage Act 1977* (NSW), including identification of potential impacts on items of heritage values, heritage conservation areas (HCAs), built heritage landscapes and archaeology during construction and operation.

The assessment of the project identified non-Aboriginal heritage values within and surrounding the project footprint by completing a desktop review of statutory heritage lists, field surveys of the study area, a review of previous heritage reports and archaeological assessments prepared for relevant items and areas within the study area, and desktop historical research including review of relevant conservation management plans. This included consideration of the history of the suburbs within the study area. The assessment evaluated the potential impacts of the project on these heritage values and each heritage item was assigned a potential impact type and impact rating. Heritage items that are proposed to be demolished were assigned a major adverse impact rating. The heritage items that have the potential to be affected by the project, including how they could be affected, have been identified in section 20.3 of the EIS. The detailed design and construction of the project would be managed to ensure that the identified potential heritage and archaeological impacts are minimised and/or avoided as far as practical, by implementing a range of environmental management measures (see **Chapter E1** (Environmental management measures)).

The EIS, including all technical working papers, was reviewed by the NSW Department of Planning and Environment (DP&E) and key government agencies to confirm that it adequately addressed the Secretary's Environmental Assessment Requirements (SEARs) for the project prior to being placed on public exhibition. Feedback received from DP&E and agencies was considered and addressed in the EIS, where relevant, prior to public exhibition.

Assessment of the impact of tunnelling (particularly in Newtown and Rozelle)

The study area for the non-Aboriginal heritage assessment (refer to section 20.1.5 of the EIS) was separated into six areas that would be subject to surface disturbance from the project, and the area above the mainline tunnel alignment. The assessment therefore focused on impacts to heritage items and HCAs associated with surface works and infrastructure, and also impacts to items fully or partially located directly above the project tunnel alignment. This included heritage items above the project tunnel alignment in areas such as Newtown and Rozelle.

Figure 6-13 to Figure 6-20 in section 6.14 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS illustrates heritage items and conservation areas listed on local, State and Section 170 Registers located above the tunnel alignment. Potential for vibration impacts on heritage items associated with tunnelling is described in section 6.11 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS. Potential settlement impacts on heritage items are described in section 6.13 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS. In the assessment of settlement and vibration impacts to heritage items consideration was given to:

- The depth of tunnelling in the vicinity of the heritage item
- Predicted settlement impacts as detailed in section 12.3.4 of the EIS
- Predicted vibration impacts as detailed in Chapter 5 of Appendix J (Technical working paper: Noise and vibration) of the EIS.

Study areas and HAMUs in the City of Sydney LGA

The study area for the non-Aboriginal heritage assessment (refer to section 20.1.5 of the EIS) includes the locations subject to surface disturbance from the project and the area above the mainline tunnel alignment. The study area for the locations subject to surface disturbance is separated into six areas (and 11 HAMUs located across these six areas). There are no areas of surface disturbance located within the City of Sydney LGA and therefore there were no HAMUs within the City of Sydney LGA identified for the non-Aboriginal heritage impact assessment. The study area for areas located above the tunnel alignment includes items within the City of Sydney LGA. Impacts to items located above and directly intersecting with the project tunnel alignment are identified in Table 6-48 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS.

Heritage properties in the Rozelle interchange construction zone

All listed and potential heritage items and conservation areas located within the Rozelle interchange construction zone, and potential impacts to these items, have been identified in section 6.7 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS.

Figure 6-15 in section 6.14 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS identifies the heritage items located above the tunnel alignment at Rozelle. Table 6-48 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS identifies the heritage items in this area of the project tunnel alignment that may be subject to indirect impacts (including nine items in Rozelle which would be subject to minor adverse impacts).

Further assessment of potential settlement impacts, including numerical modelling, will be undertaken during detailed design. In areas where ground movement in excess of settlement criteria is predicted, an instrumentation and monitoring program to measure settlement, distortion or strain will be implemented. Feasible and reasonable measures will be investigated and implemented to ensure where possible that the predicted settlement is within the criteria. Measures that will be considered may include (but are not limited to):

- Review of the proposed tunnel design including:
  - The depth and alignment of tunnels
  - The proximity of multiple tunnels to each other
  - The proposed tunnel support system
  - The tunnel lining to manage groundwater inflows
- Rationalising the layout of the proposed ventilation tunnels including the number, location and length of tunnels
- Review of the proposed construction methodology
- Consideration of ground improvement options.

A Settlement Monitoring Program will be prepared that will provide details on:

- Settlement criteria and predictions
- Location of monitoring points
- Duration of monitoring
- Data collection (type and method)
- Comparison of actual settlement with predictions
- Triggers and corrective actions that will be implemented if, based on monitoring results, actual settlement is likely to exceed predictions or the relevant criteria, with the aim of complying with the criteria.

The Settlement Monitoring Program will be endorsed the Independent Property Impact Assessment Panel (see environmental management measure PL11 in **Chapter E1** (Environmental management measures) prior to the commencement of any construction activities with the potential to result in settlement, as determined by the panel, unless otherwise agreed to by the Secretary of DP&E.

Settlement monitoring will be carried out for the period in accordance with the program starting prior to commencement of works with the potential to result in ground movement and settlement through to until all settlement has stabilised following completion of tunnel construction. The results of settlement monitoring will be compared to predicted settlement. The implementation and adequacy of the Settlement Monitoring Program will be monitored by the Independent Property Impact Assessment Panel.

In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified. Any disputes between a property or infrastructure owners regarding damage and rectification will be referred to the Independent Property Impact Assessment Panel (see environmental management measure PL11 in **Chapter E1** (Environmental management measures) for resolution.

Assessment of industrial heritage items

The non-Aboriginal heritage assessment considered heritage items and areas that reflect industrial development from the nineteenth and twentieth centuries, such as in Rozelle and Annandale (refer to section 4.4 and 4.6 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS. The Rozelle Rail Yards and Annandale are two areas in particular which are likely to contain industrial heritage value.

Potential impacts to listed and potential heritage items identified within and in the vicinity of Rozelle Rail Yards and Annandale are outlined in section 6.7 and 6.9 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS, respectively. Where impacts are unavoidable, management measures would be implemented including photographic recording, an Interpretation Strategy and a Heritage Salvage Strategy (see **section C20.7** for a summary of these measures).

Assessment of the built heritage in Bignell Lane

The assessment of industrial and built heritage issues was assessed as part of Area 5 - Annandale and in potential heritage items during the EIS process (refer to section 6.9 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS). There are no State or locally listed heritage items or HCAs located in Bignell Lane at Camperdown, however, the area was also inspected for items of potential heritage significance. The 'Former Bank of NSW', located at 164 Parramatta Road, Annandale (which backs onto Bignell Lane) was assessed as a potential heritage item of local significance and would be demolished for the project. The James Squire Brewery and Storage King building at this location were not assessed as having potential heritage significance during the site inspection.

Where impacts are unavoidable, management measures would be implemented including photographic recording, an Interpretation Strategy and a Heritage Salvage Strategy see **section C20.7** for a summary of these measures).

HAMU 10 includes Bignell Lane. There are no heritage register listings for potential historical archaeological remains within the Bignell Lane HAMU. Given the size of the twentieth century buildings and the absence of basements within this HAMU there is potential for archaeological remains to survive beneath the existing floor slabs and between building footings (refer to section 5.7.2 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS). A Historical Archaeological Research Design (HARD) would be prepared prior to the start of proposed works within HAMU 10, which would include an assessment of any detailed design plans to develop a methodology and scope for a program of test excavation to determine the nature, condition and extent of potential archaeological remains.

Research and assessment of the White Bay Power Station

The non-Aboriginal heritage assessment identified the non-Aboriginal heritage values associated with the White Bay Power Station in section 4.4.4 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS. Review and consideration of the Conservation Management Plan for the White Bay Power Station was undertaken as part of this assessment. The assessment also considered impacts on non-Aboriginal heritage value of the White Bay Power Station in sections 20.3.1 and 20.3.2 of the EIS.

The project temporarily encroaches into the south western boundary of the curtilage of the White Bay Power Station which is a State Heritage Register (SHR) listed item. The minor encroachment occurs during the construction phase of the project as a result of the alignment of the temporary Victoria Road bridge. However, the works would be some distance from the Power Station building itself and the building would not be physically impacted by the project.

One structure assessed as being a potential heritage item of State significance would be indirectly impacted through vibration, which is the southern penstock associated with the White Bay Power Station.

The EIS recognises that there are potentially extant archaeological elements associated with the White Bay Power Station HAMU (HAMU 7), including water channels associated with the southern penstock. The specific location, depth and extents of the channels are unknown. The extent and location of excavation proposed in this area would be confirmed during detailed design.

Part D (Preferred infrastructure report) of this report describes and assesses proposed changes to the project presented in the EIS. These changes include the inclusion of an additional construction ancillary facility (the White Bay civil site (C11)) located directly adjacent to but not within the listed heritage curtilage of the White Bay Power Station. An assessment of the non-Aboriginal heritage impacts as a result of this change is provided in **section D1.4.5**.

Assessment of impacts to Yasmar Estate

The Yasmar Estate is located more than 100 metres away from the mainline tunnel alignment and is therefore unlikely to be impacted by tunnelling. Under Option A and B for the construction scenario at Haberfield and Ashfield, the Yasmar Estate is located adjacent to but outside of the heritage study area (refer to section 6.5 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS) and is unlikely to be directly impacted by construction of the project. The closest extent of the construction footprint to Yasmar Estate is the Parramatta Road East civil site (C3b). Yasmar Estate would not be within vibration minimum working distances for construction activities as identified in Annexure J of Appendix J (Technical working paper: Non-Aboriginal heritage) of the EIS.

Assessment of the archaeology at Rozelle Rail Yards

The non-Aboriginal heritage impact assessment assessed historical archaeology across the project footprint, allocating 11 HAMUs across the six heritage study areas, according to historical phases, archaeological potential, past construction activities, proposed impacts and management requirements. Section 5.5.2 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS provides a detailed assessment of the archaeological potential and potential archaeological impacts within HAMU 5 – Rozelle Rail Yards (West) and HAMU 6 – Rozelle Rail Yards (East).

The heritage impact assessment for the Rozelle Rail Yards site management works also contained an archaeological assessment (refer to Rozelle Rail Yards HIA (GML 2016)).

HAMU 5 has a low potential for archaeological remains, and any surviving remains are likely to have been highly disturbed and would likely not meet the threshold for local significance. Therefore, the works proposed in HAMU 5 are unlikely to impact on significant archaeological remains.

Part of the works proposed in HAMU 6 would require deep excavation in areas where archaeological deposits may be present. These works are likely to have a moderate to minor adverse impact on the potential historical archaeological remains, depending on the location, extent and nature of the proposed works. A HARD would be prepared prior to the start of proposed works within HAMU 6, which would include an assessment of any detailed design plans to develop a methodology and scope for a program of test excavation to determine the nature, condition and extent of potential archaeological remains.

Non-Aboriginal cumulative impacts of the WestConnex program of works

Chapter 7 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS assessed the cumulative impact of non-Aboriginal heritage from the WestConnex program of works (which includes the M4-M5 Link and the New M5) and other RMS and related transport projects. This was also summarised in Chapter 26 (Cumulative impacts) of the EIS.

Overall, the cumulative impact of the WestConnex program of works on non-Aboriginal heritage items is considered to be major and irreversible given its scale and results primarily from the impacts to the Haberfield HCA from the M4 East project. The M4-M5 Link project has been assessed as resulting in a moderate adverse heritage impact.

C20.2 Impacts to non-Aboriginal historical archaeology

79 submitters raised concerns about the impacts to non-Aboriginal historical archaeology. Refer to section 20.3 of the EIS and Chapter 5 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS for an assessment of the potential impacts to historical archaeology.

C20.2.1 Impacts to potential non-Aboriginal historical archaeology

Submitters were concerned that non-Aboriginal historical archaeology would be impacted by the project. Specific concerns include that works proposed (deep excavation) around Lilyfield Road and Gordon Street may result in impacts on archaeological remains.

Response

Of the 11 HAMUs located across four of the heritage study areas, there were five in Area 3 (Rozelle), which included HAMU 3 – Lilyfield Road and Gordon Street. HAMU 3 was assessed having potential for archaeological remains of local significance.

HAMU 3 – Lilyfield Road and Gordon Street would be impacted by the project. Much of the works in this HAMU may require deep excavation in areas where archaeological deposits are likely to be present, and in the location of the known stormwater drain. Extensive ground disturbance of this kind will have a major adverse impact on any archaeological remains which may be present.

Activities associated with surface earthworks, drainage, and finishing works (such as service installation, installation of bridge foundations and landscaping) would have more localised impacts on the historical archaeological resource. These works are likely to have a minor to moderate adverse impact on the potential historical archaeological resource, depending on the location, extent and nature of the proposed works.

A Historical Archaeological Research Design (HARD) will be prepared, in consultation with NSW Heritage Council, prior to the start of proposed works within HAMU 3. The HARD will be prepared by a

qualified archaeologist in consultation with the NSW Heritage Council and will include:

- Descriptions of clear significance thresholds for possible archaeological items that may be uncovered during works
- A methodology and scope for a program of archaeological excavation, investigation, and recording of any historical archaeological remains that will be impacted by the project
- Requirement for post-excavation reporting, including artefact analysis and additional historical research, where necessary, and long term management of records
- Details of what will happen with any artefacts uncovered and associated reports.

The archaeological investigation and recording of any remains within HAMU 3 will ensure the research value of these remains is realised. Depending on what is found during the archaeological investigation, the findings would be considered during the development of the Interpretation Strategy for the project to ensure that any significant findings of the archaeological investigations are communicated to the public.

In addition, before excavation of archaeological management sites, a suitably qualified Excavation Director who complies with Criteria for Assessment of Excavation Directors (Heritage Council of NSW 2011) will be engaged to advise on matters associated with historic archaeology. Where archaeological excavation is required, the Excavation Director will oversee excavation and advise on archaeological matters (see environmental management measure NAH05 in **Chapter E1** (Environmental management measures)).

C20.3 Direct impacts on non-Aboriginal heritage items

928 submitters raised concerns about direct impacts to non-Aboriginal historical items. Refer to section 20.3 of the EIS and Chapter 6 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS for details of potential impacts to non-Aboriginal heritage items.

C20.3.1 Direct impacts on non-Aboriginal heritage items

Submitters were concerned that non-Aboriginal heritage items would be impacted by the project. Specific concerns that were raised included:

- Request for a list of existing heritage structures which are proposed to be demolished
- Places would be demolished that are of potential heritage significance but are not approved under statutory heritage recognition
- Demolition of heritage buildings and urban heritage, specifically at Rozelle (including the stormwater canal) and 50 heritage listed homes in Haberfield/Ashfield
- The demolition of heritage listed houses will destroy the heritage of Victoria Road
- Heritage listed houses at Ashfield and Haberfield will be acquired for the project
- Demolition of historical warehouses, bank, brewery and laneways between Pyrmont Bridge Road and Mallet Street and historic street frontages around Bignell Lane, Camperdown
- Heritage houses that have already been demolished at the St Peters Interchange
- Direct impacts to heritage items in Newtown
- The use of a rockbreaker may directly impact heritage items at Camperdown and Haberfield
- Concern that the EIS team do not appreciate the value of heritage items, and that it is pushed aside if it prevents project plans
- Concern that by designating the project ‘State significant infrastructure’, damage to heritage is acceptable
- The plan will impact on key high level heritage protection areas and sites in Newtown with a significant number of heritage protected buildings in the project's footprint. The damage to them will seriously impact our national cultural history.

A number of submitters advocated comments from the Heritage Council of NSW, stating that the significant direct impact on heritage buildings is not acceptable.

Response

Construction of a transport infrastructure project of this scale in an established urban area will inevitably generate a range of localised impacts. For this project, one of the unavoidable impacts is the partial and full demolition of structures, including listed and potential heritage items. Where feasible and reasonable, the aboveground motorway infrastructure has been located and designed to reduce heritage impacts. The benefits of the project must be balanced against impacts, and the project must be able to demonstrate an overall net community benefit. The benefits and impacts of the project were comprehensively assessed in the EIS and associated technical working papers, and management measures are proposed to minimise impacts where possible. Potential impacts to heritage items have been considered and minimised during the preparation of the concept design for the project. See the sections below for further information.

Demolition of structures

The M4-M5 Link is considered to have a moderate adverse impact to non-Aboriginal heritage overall, with direct impacts, including the demolition of buildings.

The non-Aboriginal heritage impact assessment in the EIS concluded that the project would potentially impact both listed and potential heritage items. The listed heritage items across the study area that the project would directly affect are:

- Demolition of three statutory heritage items of local heritage significance, being:
  - Stormwater canal at Lilyfield Road, Rozelle
  - ‘Cadden Le Messurier’ at 84 Lilyfield Road, Rozelle
  - Former hotel at 78 Lilyfield Road, Rozelle
- Partial demolition of one statutory heritage item of local heritage significance, being the Whites Creek Stormwater Channel No. 95
- The project temporarily encroaches into the south-western boundary of the curtilage of the White Bay Power Station which is a SHR listed item. The minor encroachment occurs during the construction phase of the project, as a result of the alignment of the temporary Victoria Road bridge. However, the works would be some distance from the power station building itself and the building would not be physically impacted by the project.

The individual buildings/structures assessed as being potential local heritage items which would be fully demolished are:

- Victoria Road bridge at Rozelle
- Former White Bay Hotel site foundations (plinth and archaeology) at Rozelle
- 260 Victoria Road, Rozelle
- 262 Victoria Road, Rozelle
- 264 Victoria Road, Rozelle
- 266 Victoria Road, Rozelle
- 248 Victoria Road, Rozelle
- 250 Victoria Road, Rozelle
- 164 Parramatta Road (former Bank of NSW), Annandale.

In addition, the sandstone cutting on the northern side of Rozelle Rail Yards (a landscape feature) was assessed as being a potential local heritage item and would be partially demolished.

Demolition of the stormwater channel at Rozelle would result in the permanent loss of the heritage item. It would remove evidence of early stormwater management infrastructure associated with the industrialisation of this area.

The potential for heritage impacts resulting from the project in the Rozelle area would arise from the demolition of SREP listed heritage items (Stormwater Canal, 'Cadden Le Messurier' and Former Hotel) and contributory items within the Hornsey Street HCA to facilitate the dive portals, cut-and-cover tunnels, and ancillary infrastructure. Management measures would be implemented for these heritage items including photographic archival recording and the preparation of an Interpretation Strategy and a Heritage Salvage Strategy. These environmental management measures (NAH03, NAH02 and NAH09 respectively) are listed in **Chapter E1** (Environmental management measures).

Victoria Road

No listed heritage items would be demolished along Victoria Road as a result of the project (refer to section 6.8 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS).

Six potential heritage items identified as being of local heritage significance located along Victoria Road would be demolished as a result of the project. Management measures would be implemented, including photographic recording of some houses along Victoria Road, and the preparation and implementation of an Interpretation Strategy and a Heritage Salvage Strategy. These measures are listed in **Chapter E1** (Environmental management measures).

Haberfield and Ashfield

Two heritage items listed in the Ashfield Local Environmental Plan 2013 (Haberfield HCA and a commercial building at 479 Parramatta Road, Ashfield) were identified within Area 1 (refer to section 20.3.2 of the EIS). These items were assessed as having a neutral impact rating associated with visual setting, vibration and settlement impacts (refer to section 20.3.2 of the EIS). The construction footprint for the Parramatta Road West civil and tunnel site (C1b) and Parramatta Road East civil site (C3b) do not contain heritage items and are not within the HCA. A number of potential heritage items were identified in Bland Street and Alt Street in the vicinity of the construction footprint, however due to the physical separation of these items from the construction footprint their impact was assessed as neutral (refer to section 20.3.3 of EIS).

Camperdown

There are no listed heritage items that would be directly impacted between Parramatta Road and Mallet Street as part of the project and this area is not located in a HCA. However, as listed above, the 'Former Bank of NSW' located at 164 Parramatta Road at Annandale was assessed as having potential heritage significance (refer to Table 20-18 of the EIS and Annexure A of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS). This item would be subject to a direct impact through demolition to allow for the construction of the Pyrmont Bridge Road tunnel site (C9). There were no other potential heritage items identified between Pyrmont Bridge Road and Mallet Street, or in Bignell Lane, which would be directly impacted by the project.

Environmental management measure NAH03 (see **Chapter E1** (Environmental management measures)) proposes that photographic archival recording will be undertaken of the Former Bank of NSW in accordance with the NSW Heritage Office guidelines *Photographic Recording of Heritage Items Using Film or Digital Capture* (2006). The photographic archival recording will occur prior to any works that have the potential to impact on the building and the report development process will include the identification of appropriate stakeholders to receive copies of the documentation.

St Peters interchange

There would be no heritage items demolished in the vicinity of the St Peters interchange for the M4-M5 Link project. The demolition of heritage items in this area to allow the construction of the St Peters Interchange was assessed as part of the New M5 EIS (AECOM 2015b). This included the preparation and implementation of a heritage salvage strategy. Cumulative impacts of the M4-M5 Link with other WestConnex component projects, including the New M5 project, are described and assessed in Chapter 26 (Cumulative impacts) of the EIS.

Newtown

No areas of surface disturbance from the project would be located within Newtown, and no heritage items or conservation areas in Newtown would be directly impacted by the project.

Section 20.30.2 of the EIS identified the listed and potential non-Aboriginal heritage items within the study area that would be potentially subject to indirect impacts as a result of tunnelling through vibration and settlement during construction. Table 6-48 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS contains details of the heritage items and HCAs located above and directly intersecting the project tunnel alignment only. It was concluded that the project would have a 'neutral' or 'minor adverse' impact on all heritage items listed in Table 6-48 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS that are within Newtown, given the depth of the tunnelling and predicted levels of settlement in the vicinity of the heritage items. Environmental management measures to manage potential settlement impacts are described in **Chapter E1** (Environmental management measures).

Blasting and rockbreaking

Blasting and rockbreaking may be used to help excavate the tunnels. If blasting is proposed during detailed design, a Blast Management Strategy will be prepared in accordance with relevant guidelines. The alignment of the tunnels and the locations of tunnel portals have given regard to maximising the use of the best possible geotechnical conditions, therefore reducing the impact of tunnelling (including the use of roadheaders and rockbreakers) on properties at the surface.

Impacts to heritage items due to blasting or rockbreaking for tunnelling would be indirect (rather than direct). Potential indirect impacts on non-Aboriginal heritage items as a result of tunnelling, including vibration and settlement, are addressed in section 20.3.4 of the EIS.

A range of measures have been proposed to avoid and/or minimise potential impacts to heritage and indirect impacts through vibration (see **Chapter E1** (Environmental management measures)), including:

- CNVMP will be prepared for the project. The plan will:
  - Identify relevant performance criteria in relation to noise and vibration
  - Identify noise and vibration sensitive receivers and features in the vicinity of the project
  - Include standard and additional mitigation measures from the *Construction Noise and Vibration Guideline* (CNVG) (NSW Roads and Maritime Services (Roads and Maritime) 2016) and details about when each will be applied
  - Describe the process(es) that will be adopted for carrying out location and activity specific noise and vibration impact assessments to assist with the selection of appropriate mitigation measures
  - Include protocols that will be adopted to manage works required outside standard construction hours in accordance with relevant guidelines
  - Detail monitoring that will be carried out to confirm project performance in relation to noise and vibration performance criteria
- Location and activity specific noise and vibration impact assessments will be carried out prior to (as a minimum) activities:
  - With the potential to result in noise levels above 75 dBA at any receiver
  - Required outside standard construction hours likely to result in noise levels greater than the relevant noise management levels
  - With the potential to exceed relevant performance criteria for vibration

  The assessments will clarify predicted impacts at relevant receivers in the vicinity of the activities to assist with the selection of appropriate management measures, consistent with the requirements of *Interim Construction Noise Guideline* (NSW Department of Environment and Climate Change NSW (DECC) 2009) (ICNG) and CNVG that will be implemented during the works
- Monitoring will be carried out at the commencement of activities for which a location and activity specific noise and vibration impact assessment has been prepared to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the management measures that have been implemented are appropriate
- A Blast Management Strategy will be prepared and implemented for the project if blasting is proposed. The strategy will:

- Identify relevant performance criteria in relation to potential noise and vibration impacts due to blasting with reference to (as a minimum) *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (Australian and New Zealand Environment Conservation Council (ANZECC) 1990) and Australian Standard AS 2187.2-2006 Explosives - Storage, transport and use, Part 2: Use of explosives
- Describe trials that will be carried out to confirm vibration levels from blasting and facilitate development of predictive tools to allow potential noise and vibration impacts to be identified
- Include details of management measures that will be implemented to ensure compliance with relevant performance criteria
- Include details of community consultation requirements prior to commencing blasting
- The Blast Management Strategy will be implemented for all blasting carried out as part of the project.

Concern over value held for and damage to Non-Aboriginal heritage

As outlined in the responses above, construction of a State significant transport infrastructure project of this scale in an established urban area will inevitably generate a range of impacts. The impact to heritage has been reduced by tunnelling and through the selection process for construction ancillary facilities. The criteria for selection of construction sites included consideration of surrounding land uses including heritage values.

Specific impacts to heritage from the M4-M5 Link project have been avoided through:

- Locating the Rozelle interchange predominantly underground, resulting in construction activities being contained within the Rozelle Rail Yards with no impact on the adjacent Easton Park (locally listed)
- Retaining important elements of the White Bay Power Station site
- Removal of the Camperdown interchange which avoided direct and indirect impacts on HCAs and heritage items such as the University of Sydney and Victoria Park (both subject to an application for State significance) and on the locally listed sandstone retaining wall on the northern side of Parramatta Road
- Removal of potential construction ancillary facility considered at Easton Park which avoided direct impact to the locally listed park, reduced impacts on the Easton Park HCA, as well as allowing the retention of the locally listed Sewage Pumping Station No.6
- Removal of the potential construction ancillary facility considered at Angel Street/Railway Lane construction ancillary facility at Newtown from the construction footprint which avoided direct impact (demolition) on the former Newtown Tram Sheds (of State significance)
- Removal of the potential mid-point construction ancillary facility considered at Derbyshire Road which avoided direct impact (demolition) of one local heritage item, which consisted of two buildings, including the former State Rail Authority (SRA) cable store and traffic office at Leichhardt.

Refer to Chapter 4 (Project development and alternatives) of the EIS for further detail on the development of the project including consideration of alternative construction ancillary facilities.

Management of impacts

Management measures to avoid, reduce and manage impacts to heritage items are outlined in **Chapter E1** (Environmental management measures), which include specific measures for items that would be demolished, including photographic archival recording, the implementation of a Heritage Salvage Strategy and an Interpretation Strategy. The Interpretation Strategy will be developed and implemented to identify and interpret the key heritage values and stories of the heritage areas affected by the project and inform the development of the Urban Design and Landscape Plans (UDLPs) for the project, in accordance with NSW Heritage Office *Interpreting Heritage Places and Items Guideline August 2005* (see environmental management measure NAH02 in **Chapter E1** (Environmental management measures)).

A Construction Heritage Management Plan (CHMP) will also be prepared and implemented as part of the Construction Environmental Management Plan, which would include measures that will be implemented to manage potential impacts to items of heritage significance and include heritage awareness and management training for relevant personnel involved in site works (see environmental management measure NAH01 in **Chapter E1** (Environmental management measures)).

The detailed design and construction will be managed to ensure, as far as possible, that the identified potential heritage impacts are minimised and/or avoided by the implementation of a range of general and specific measures.

C20.3.2 Impacts to heritage items within the Rozelle Rail Yards

Submitters requested that heritage items at the Rozelle Rail Yards be retained.

Response

Roads and Maritime has undertaken an assessment under Part 5 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) for a suite of site management works on part of the Rozelle Rail Yards. These works would remove rail and rail related infrastructure from the site and allow existing issues at the site such as waste and noxious weeds to be appropriately managed.

Key features of the works include removal of existing above ground rail infrastructure including gantries, railway lines, ballast, sleeps and buildings (excluding the southern penstock, switching station, transformer and rail infrastructure to the east of the Victoria Road bridge) generally to a depth of 500 millimetres below ground level, except where drainage channels and sediment basins are required. The site management works were assessed in a Review of Environmental Factors (REF) which was approved by Roads and Maritime under Part 5 of the EP&A Act on 10 April 2017 and which can be accessed on the Roads and Maritime website[1]. The environmental assessment included the preparation of a heritage impact assessment. Mitigation measures including archival recordings of these items and salvage and storage of the lighting tower and rail gantries for potential reuse in future development of the Rozelle Rail Yards were recommended in the REF. See **section C30.3.1** for response to submissions raised on the Rozelle Rail Yards site management works.

The historical significance of the Rozelle Rail Yards was comprehensively assessed in section 20.2.3 and Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS. The assessment found that there would be no direct heritage impacts to listed heritage items at the Rozelle Rail Yards as part of the M4-M5 Link project.

However, a potential heritage item located within the Rozelle Rail Yards would be impacted, being the sandstone cutting. This potential heritage item has been assessed in the EIS as having local heritage significance and would be partially demolished as a result of the new motorway portals.

The Victoria Road bridge, which is located above a small section of the Rozelle Rail Yards, would be demolished as part of the project. This item is not a listed heritage item but has been assessed in the EIS as a potential heritage item of local heritage significance.

The White Bay Power Station southern penstock (and its associated water channels) is located within the Rozelle Rail Yards to the east of the Victoria Road bridge. The item is to be retained, however it has the potential to be indirectly impacted through vibration. A condition assessment of the southern penstock (and its associated water channels) will be carried out by a heritage specialist and a structural engineer prior to any works in the vicinity. In addition, the southern penstock and its associated water channels (location and extent unknown) will be protected from indirect impacts during works associated with the reconstruction of the Victoria Road bridge.

Where impacts are unavoidable, measures would be implemented including photographic archival recording, an Interpretation Strategy and a Heritage Salvage Strategy. The Interpretation Strategy would identify how the rail related infrastructure salvaged from the Rozelle Rail Yards will be reused.

Chapter D2 (White Bay civil site (C11)) describes an additional construction ancillary facility at Rozelle, adjacent to the east of the White Bay Power Station, primarily for heavy vehicle truck marshalling and construction workface parking. The northern penstock, an associated feature of the White Bay Power Station, is partly within the cosmetic damage minimum working distances for vibration associated with construction activities proposed at the site, and therefore may potentially be indirectly impacted (see **Figure D2-7**).

[1] http://www.rms.nsw.gov.au/projects/sydney-inner/rozelle-rail-yard-site-management/index.html#Projectdocuments

As required by environmental management measure NAH16 (see **Chapter E1** (Environmental management measures)), a condition assessment of the northern penstock will also be carried out by a heritage specialist and a structural engineer prior to any vibratory works in the vicinity that have the potential to impact on the item. The condition assessment will inform additional management measures to protect the northern penstock, if required. Any conservation works required to limit potential impacts on deteriorated fabric (loose bricks, corroded steel) will be identified and implemented prior to commencement of the relevant vibratory works in the vicinity. Further assessment of the northern penstock is provided in **section D2.4.2** and **section D2.4.6**.

C20.4 Indirect impacts to non-Aboriginal heritage items

683 submitters raised concerns about indirect impacts to non-Aboriginal heritage items. Refer to section 20.3 of the EIS and Chapter 6 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS for details of potential impacts to non-Aboriginal heritage items.

C20.4.1 Indirect impacts to non-Aboriginal heritage items

Submitters raised concern regarding potential for the project to result in indirect impacts to non-Aboriginal heritage through potential vibration, settlement and change in visual setting. Potential indirect impacts of concern raised by submissions included:

- Potential impacts of tunnelling on heritage items in Newtown and Rozelle
- The three layers of tunnelling under Rozelle is technically complicated and poses a risk to heritage homes and buildings
- Potential for ground movement to impact heritage structures at Newtown, including the Silos building in Gladstone Street, which is close to the tunnel alignment near Station Street
- Heritage items and areas in the inner west that are not directly affected would be degraded as a result of impacts on historic communities
- Twenty-one statutory listed (State and local) items of heritage would be subject to indirect impacts through vibration, settlement and visual setting
- The Rozelle interchange will impact the heritage area and heritage houses, due to the concrete portals, large volumes of traffic and construction disruptions including increased noise and vibration
- Further loss of heritage houses affecting the visual amenity of the environment
- Potential for indirect impacts to occur on the historic Yasmar Estate
- After construction is complete, traffic around the St Peters interchange has the potential to impact the visual amenity of existing heritage at Newtown, Enmore and Stanmore
- Potential for impacts to heritage properties at Glebe.

Response

Section 20.30.2 of the EIS identified the listed and potential non-Aboriginal heritage items within the study area that would be potentially subject to indirect impacts through vibration and settlement during construction, and indirect impacts through visual setting during construction and operation. Twenty-one heritage items were identified to have the potential to be indirectly impacted, however the magnitude of these impacts were found to be either minor adverse or neutral.

The Yasmar Estate is located more than 100 metres away from the mainline tunnel alignment and is therefore unlikely to be impacted by tunnelling. Under Option A and B for the construction scenario at Haberfield and Ashfield, the Yasmar Estate is located adjacent to but outside of the heritage study area (refer to section 6.5 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS) and is unlikely to be directly impacted by construction of the project.

The closest extent of the construction footprint to Yasmar Estate is the Parramatta Road East civil site (C3b). Yasmar Estate would not be within vibration minimum working distances for construction activities as identified in Annexure J of Appendix J (Technical working paper: Non-Aboriginal heritage) of the EIS.

No heritage properties in Glebe have been identified as being potentially indirectly impacted as a result of settlement, vibration or visual setting for the project.

Tunnelling impacts at Rozelle and Newtown

Figure 6-13 to Figure 6-20 in section 6.14 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS illustrates heritage items and conservation areas listed on local, State and Section 170 Registers located above the tunnel alignment including within Rozelle and Newtown. Potential for vibration impacts on heritage items associated with tunnelling is described in section 6.11 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS. Potential settlement impacts on heritage items are described in section 6.13 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS. In the assessment of settlement and vibration impacts to heritage items consideration was given to:

- The depth of tunnelling in the vicinity of the heritage item
- Predicted settlement impacts as detailed in section 12.3.4 of the EIS
- Predicted vibration impacts as detailed in Chapter 5 of Appendix J (Technical working paper: Noise and vibration) of the EIS.

Table C20-1 contains details of the heritage items and HCAs located above and directly intersecting the project tunnel alignment at Rozelle and Newtown. **Table C20-1** is an extract of the relevant items from Table 6-48 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS. The project is expected to have a minor adverse vibration and/or settlement impact on heritage items that are shaded grey in **Table C20-1**, meaning the project would either affect only a small part of the item or a distant/small part of the setting of a heritage place. The impact may also be temporary and/or reversible. Impacts to other items in **Table C20-1** (ie not shaded grey), have been identified as neutral, meaning they would have no heritage impact.

Table C20-1 Heritage items and HCAs on local, State and S170 Registers located above or directly intersecting the tunnels at Newtown and Rozelle

Item name	Address	Significance	Listing	Depth of tunnel at this location	Impact type	Impact rating
Corner shop – including interiors	88 Chelmsford Street, Newtown	Local	Marrickville Local Environment Plan (LEP) 2011 #I141	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Victorian Georgian house and stables – including interiors	38 and 54 Albermarle Street, Newtown	Local	Marrickville LEP 2011 #I130	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Group of Victorian Style Terraces – including interiors	92–98 Chelmsford Street, Newtown	Local	Marrickville LEP 2011 #I142	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Former electricity substation	134 Lennox Street, Newtown	Local	Marrickville LEP 2011 #I163	35 m to 65 m below ground	Unlikely to be impacted	Neutral
St Joseph's Boys School – including interiors	93 Chelmsford Street, Newtown	Local	Marrickville LEP 2011 #I309	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Bedford Street Retail Group – including interiors	15, 27 and 37 Bedford Street and 167 Probert Street, Newtown	Local	Marrickville LEP 2011 #I138	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Community building ‘St George’s Hall’ (352 King Street) including interior	344–358 King Street, Newtown	Local	Sydney LEP 2012 #I1014	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Saints Constantine and Helen Greek Orthodox Church including buildings and their interiors, front fence and grounds	366–378 King Street, Newtown	Local	Sydney LEP 2012 #I1015	35 m to 65 m below ground	Unlikely to be impacted	Neutral

Item name	Address	Significance	Listing	Depth of tunnel at this location	Impact type	Impact rating
Service station 'Rising Sun' (426 King Street) including interior and front forecourt	424–430 King Street, Newtown	Local	Sydney LEP 2012 #I1016	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Commercial building including interior	482–496 King Street, Newtown	Local	Sydney LEP 2012 #I1017	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Commercial building including interior	522–524A King Street, Newtown	Local	Sydney LEP 2012 #I1018	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Formerly 'Molloys' shop – including interiors	539 King Street, Newtown	Local	Marrickville LEP 2011 #I156	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Shop counters – including interiors	555 King Street, Newtown	Local	Marrickville LEP 2011 #I157	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Newtown/Erskineville	King Street	Local	Sydney LEP 2012 C47	35 m to 65 m below ground	Unlikely to be impacted	Neutral
House – including interiors	5 Coulon Street, Rozelle	Local	Leichhardt LEP 2013 #I733	Greater than 65 m below ground	Unlikely to be impacted	Neutral
House – including interiors	7 Coulon Street, Rozelle	Local	Leichhardt LEP 2013 #I734	Greater than 65 m below ground	Unlikely to be impacted	Neutral
House – including interiors	9 Coulon Street, Rozelle	Local	Leichhardt LEP 2013 #I735	Greater than 65 m below ground	Unlikely to be impacted	Neutral
House – including interiors	11 Coulon Street, Rozelle	Local	Leichhardt LEP 2013 #I736	Greater than 65 m below ground	Unlikely to be impacted	Neutral
House – including interiors	13 Coulon Street, Rozelle	Local	Leichhardt LEP 2013 #I737	Greater than 65 m below ground	Unlikely to be impacted	Neutral
House – including interiors	15 Coulon Street, Rozelle	Local	Leichhardt LEP 2013 #I738	Greater than 65 m below ground	Unlikely to be impacted	Neutral
House – including interiors	17 Coulon Street, Rozelle	Local	Leichhardt LEP 2013 #I739	Greater than 65 m below ground	Unlikely to be impacted	Neutral

Item name	Address	Significance	Listing	Depth of tunnel at this location	Impact type	Impact rating
House – including interiors	21 Coulon Street, Rozelle	Local	Leichhardt LEP 2013 #I740	Greater than 65 m below ground	Unlikely to be impacted	Neutral
St Thomas' Church group including interiors	668 Darling Street, Rozelle	Local	Leichhardt LEP 2013 #I745	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Stone building – including interiors	75 Evans Street, Rozelle	Local	Leichhardt LEP 2013 #I758	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Semi-detached house – including interiors	77 Evans Street, Rozelle	Local	Leichhardt LEP 2013 #I759	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Semi-detached house – including interiors	79 Evans Street, Rozelle	Local	Leichhardt LEP 2013 #I760	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Terrace – including interiors	101 Evans Street, Rozelle	Local	Leichhardt LEP 2013 #I762	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Terrace – including interiors	103 Evans Street, Rozelle	Local	Leichhardt LEP 2013 #I763	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Former Mechanics Institute – including interiors	114 Victoria Road, Rozelle	Local	Leichhardt LEP 2013 #I806	Greater than 35 m below ground	Unlikely to be impacted	Neutral
Former tramway stables and substation garage – including interiors	10A Hancock Street, Rozelle	Local	Leichhardt LEP 2013 #I770	Greater than 35 m below ground	Unlikely to be impacted	Neutral
Single storey shops – including interiors	731–735 Darling Street, Rozelle	Local	Leichhardt LEP 2013 #I748	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Single storey commercial building – including interiors	736 Darling Street, Rozelle	Local	Leichhardt LEP 2013 #I749	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Corner building – including interiors	22 Belmore Street, Rozelle	Local	Leichhardt LEP 2013 #I729	Greater than 65 m below ground	Unlikely to be impacted	Neutral
Semi-detached house – including interiors	122 Foucart Street, Rozelle	Local	Leichhardt LEP 2013 #I766	35 m to 65 m below ground	Unlikely to be impacted	Neutral

Item name	Address	Significance	Listing	Depth of tunnel at this location	Impact type	Impact rating
Semi-detached house – including interiors	120A Foucart Street, Rozelle	Local	Leichhardt LEP 2013 #I767	35 m to 65 m below ground	Unlikely to be impacted	Neutral
Easton Park HCA		Local	Leichhardt LEP 2013 C18	Ground to 65m below ground	Refer to detailed impact assessment in Chapter 6 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS	
Easton Park	Denison Street, Rozelle	Local	Leichhardt LEP 2013 #I752	Ground to 65m below ground	Refer to detailed impact assessment in Chapter 6 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS	
Sewage Pumping Station No. 6 (SP0006)	Lilyfield Road, Rozelle	Local	Sydney Water S170 # 4571704	Ground to 65m below ground	Refer to detailed impact assessment in Chapter 6 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS	
Semi-detached house – including interiors	15 Burt Street, Rozelle	Local	Leichhardt LEP 2013 #I730	10 m to 35 m below ground	Potential settlement and vibration	Minor adverse
Semi-detached house, including interiors	17 Burt Street, Rozelle	Local	Leichhardt LEP 2013 #I731	10 m to 35 m below ground	Potential settlement and vibration	Minor adverse
Smith's Hall including interiors	56 Burt Street, Rozelle	Local	Leichhardt LEP 2013 #I732	10 m to 35 m below ground	Potential settlement and vibration	Minor adverse
Corner shop and residence – including interiors	67 Denison Street, Rozelle	Local	Leichhardt LEP 2013 #I753	10 m to 35 m below ground	Potential settlement and vibration	Minor adverse
Shop and residence including interiors	69 Denison Street, Rozelle	Local	Leichhardt LEP 2013 #I754	10 m to 35 m below ground	Potential settlement and vibration	Minor adverse

Item name	Address	Significance	Listing	Depth of tunnel at this location	Impact type	Impact rating
House 'Rotherhithe Cottage' including interiors	73 Denison Street, Rozelle	Local	Leichhardt LEP 2013 #I755	10 m to 35 m below ground	Potential settlement and vibration	Minor adverse
Cottage and former broom factory including interiors	84 Foucart Street, Rozelle	Local	Leichhardt LEP 2013 #I765,	35 m to 65 m below ground	Unlikely to be impacted	Neutral

Figure 6-13 to Figure 6-20 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS illustrates heritage items and conservation areas listed on local, State and Section 170 Registers located above the tunnel alignment. Figure 6-18 identifies that the 'Cragos Flour Mill Site, including interiors' (the Silos building in Gladstone Street) is a local heritage listed item under the Sydney Local Environmental Plan 2012 (Item #I152). It is located around 80 metres from the mainline tunnel alignment for the project and identified in **Figure C20-1**. Considering the Cragos Flour Mill Site is located around 80 metres from the tunnel alignment and the tunnel would be around 40 metres below ground at this point, it is unlikely that this item would be indirectly impacted by tunnelling. The predicted level of settlement at this location would be within accepted settlement criteria (refer to section 12.3.4 of the EIS and Figure 12-21 of the EIS.)

Management measures to avoid and/or minimise indirect impacts to heritage items due to vibration and settlement are outlined in **Chapter E1** (Environmental management measures). These management measures are listed in **section C20.7**.

Visual setting impacts

Section 20.3.2 of the EIS identified that the project has the potential to impact on the curtilage or visual setting of heritage items or HCAs and potential heritage items during construction and operation.

The majority of the project footprint would be underground. However, surface works would be required to support tunnelling activities as well as construction ancillary facilities and to construct surface infrastructure such as interchanges, tunnel portals, ventilation facilities, ancillary operations buildings and facilities.

Table 20-17 of the EIS summarises the potential impacts on listed heritage items, including those which would be subject to setting (such as visual) impacts. The suburbs of Newtown, Enmore and Stanmore are located along the tunnel alignment and are not located within the areas of surface works and disturbance. It is therefore considered unlikely that they would be subject to visual impacts during either construction or operation. Additional traffic to be generated on surface roads by the project is not considered likely to impact on the visual setting of heritage items or HCAs. A number of surface roads are predicted to have reduced surface road traffic as a result of the project (refer to section 8.3.3 of the EIS).

A CHMP will be prepared and implemented as part of the Construction Environmental Management Plan (CEMP). The CHMP will include measures that will be implemented to manage potential impacts on items of heritage significance during construction (including impacts on visual setting) (see environmental management measure NAH01 in **Chapter E1** (Environmental management measures)).

The Rozelle interchange has been designed to be located mostly underground, minimising visual impacts on heritage items. Entrances and exits (tunnel portals) are also mostly orientated to face away from the heritage items and areas located at Rozelle. Potential visual setting impacts to items and HCAs located at Rozelle were assessed in the EIS and summarised in Table 20-17 of the EIS. Six listed items within Area 3 (Rozelle, Lilyfield and Annandale) would be subject to indirect minor adverse visual setting impacts, meaning the impact would be temporary and/or reversible.

The demolition of six potential heritage items at Rozelle along Victoria Road would impact on the streetscape of Victoria Road. Management measures would be implemented to minimise and mitigate the heritage impacts as a result of the demolition (see **section C20.7**).

During detailed design, consideration will be given to using urban design techniques such as architectural design, building materials and colour palettes to merge new infrastructure into the existing visual environment where feasible and reasonable.

Management measures to avoid and/or minimise impacts to the visual setting of non-Aboriginal heritage includes:

- An Interpretation Strategy will be developed and implemented to identify and interpret the key heritage values and stories of the heritage areas affected by the project and inform the development of the UDLPs for the project, in accordance with *Interpreting Heritage Places and Items Guideline* (NSW Heritage Office 2005) (see environmental management measure NAH02 in **Chapter E1** (Environmental management measures))
- The potential for impacts to the railway cutting on the eastern side of Victoria Road, associated with the White Bay Power Station, will be considered during the development of the detailed design for the realigned Victoria Road and associated bridge. The final design will seek to avoid

impact to the railway cutting and maintain the visual relationship between the cutting and the White Bay Power Station site. Landscaping sympathetic to the relationship, developed in consultation with a heritage specialist, will be included in the UDLPs for the project (see environmental management measure NAH11 in **Chapter E1** (Environmental management measures))

- Landscaping, following the construction of the substation, should consider screening the substation and water treatment plant, from the Leichhardt (Charles Street) Underbridge. The design and location of the landscaping will be informed by a heritage specialist and should seek to create a visual separation between the new structure and the heritage item (see environmental management measure NAH15 in **Chapter E1** (Environmental management measures)).

Appendix O (Technical working paper: Landscape and visual impact) of the EIS provides a detailed visual impacts of the project during construction and operation and also recommends various management measures to minimise these impacts which are summarised in **Chapter E1** (Environmental management measures).

Noise and vibration impacts

Section 20.3.4 of the EIS identified that the construction of project may result in vibration impacts to heritage items as a result of vibration intensive construction activities and equipment. Potential vibration impacts to heritage items were assessed. The assessment found that 11 listed heritage items are located within safe working distances of the surface works for the project and may experience vibration impacts. These items are summarised in **Table C20-2**. Potential vibration impacts to the White Bay Power Station northern penstock from the White Bay civil site (C11) are described in **section D2.4.5**.

The project would result in partial demolition and reshaping of the Whites Creek Stormwater Channel No. 95, resulting in moderate vibration (and setting) impacts. This item is shaded grey in **Table C20-2**.

Table C20-2 Summary of potential impacts on listed heritage items within safe working distances of the project that may experience vibration impacts

Area	Item	Significance	Register	Impact type	Impact rating
Area 2 – Leichhardt	Leichhardt (Charles Street) Underbridge	Local	• RailCorp S170 Register (#4805738)	Setting (from removal of existing trees along the northern boundary of the Darley Road civil and tunnel site (C4)), vibration	Minor adverse
Area 3 – Rozelle, and Lilyfield	White Bay Power Station (including northern and southern penstocks)	State	• SHR (01015) • SREP 26 (11) • Pacific Power S170 Register (74)	Vibration, setting and minor curtilage encroachment	Minor adverse
	Easton Park	Local	• Leichhardt LEP 2013 (ID I752)	Setting (disturbance of tree roots), temporary visual impacts) vibration and settlement	Minor adverse
	Sewage Pumping Station No. 6	Local	• Sydney Water S170 Register (#4571704)	Setting, vibration and settlement	Minor adverse
	Whites Creek Stormwater Channel No. 95	Local	• Sydney Water S170 Register (#4570343)	Partial demolition, reshaping, setting, and vibration	Moderate adverse
	Annandale (Railway Parade) Railway Bridge	Local	• SREP 26 (7) • RailCorp S170 Register (#4803231)	Setting, vibration	Minor adverse
	Annandale (Johnston Street) Underbridge	Local	• SREP 26 (9) • RailCorp S170 Register (#4803229)	Setting, vibration	Neutral
Area 5 – Annandale	Kerb and gutter on Chester Street	Local	• Leichhardt LEP 2013 (ID I613)	Setting, vibration	Neutral
	Warehouse including interiors at 52–54 Pyrmont Bridge Road	Local	• Leichhardt LEP 2013 (ID I616)	Setting, vibration	Minor adverse
	Former Grace Bros Repository including interiors	Local	• Sydney LEP 2012 (ID I2242)	Setting, vibration	Minor adverse
	Bridge Road School (former Camperdown Public School), including interiors	Local	• Marrickville LEP 2011 (ID I5)	Setting, vibration and settlement	Minor adverse

The noise and vibration assessment in Appendix J (Technical working paper: Noise and vibration) of the EIS assesses minimum working distances for vibration intensive plant. Where vibration impacts are predicted, a number of mitigation measures can be implemented including:

- Validation of predicted vibration levels at the nearest receiver buildings to the vibration intensive works
- Use of alternative methods to de-couple load path/equipment that generates less vibration where feasible and reasonable.

Vibration trials and/or attended vibration monitoring or would be undertaken prior to and during any works proposed within the minimum working distances for cosmetic damage to ensure that levels remain below the criteria. In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified.

Operational vibration due to the movement of cars and trucks inside the tunnel is considered to be negligible and would not be expected to cause any noticeable impact at surface level properties (refer to section 4.10 of Appendix J (Technical working paper: Noise and vibration) of the EIS.

Potential vibration impacts to features of heritage significance will be managed in accordance with the recommendations of the noise and vibration assessment including the Construction Noise and Vibration Management Plan (CNVMP) prepared for the project, summarised in **Chapter E1** (Environmental management measures), including:

- Location and activity specific noise and vibration impact assessments will be carried out prior to (as a minimum) activities:
  - With the potential to result in noise levels above 75 dBA at any receiver
  - Required outside standard construction hours likely to result in noise levels greater than the relevant noise management levels
  - With the potential to exceed relevant performance criteria for vibration.
  - The assessments will clarify predicted impacts at relevant receivers in the vicinity of the activities to assist with the selection of appropriate management measures, consistent with the requirements of the ICNG and CNVG that will be implemented during the works
- Monitoring will be carried out at the commencement of activities for which a location and activity specific noise and vibration impact assessment has been prepared to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the management measures that have been implemented are appropriate

Also, in the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified. Any disputes between a property or infrastructure owners regarding damage and rectification will be referred to the Independent Property Impact Assessment Panel (see environmental management measures PL11 and PL13 in **Chapter E1** (Environmental management measures)).

Settlement impacts

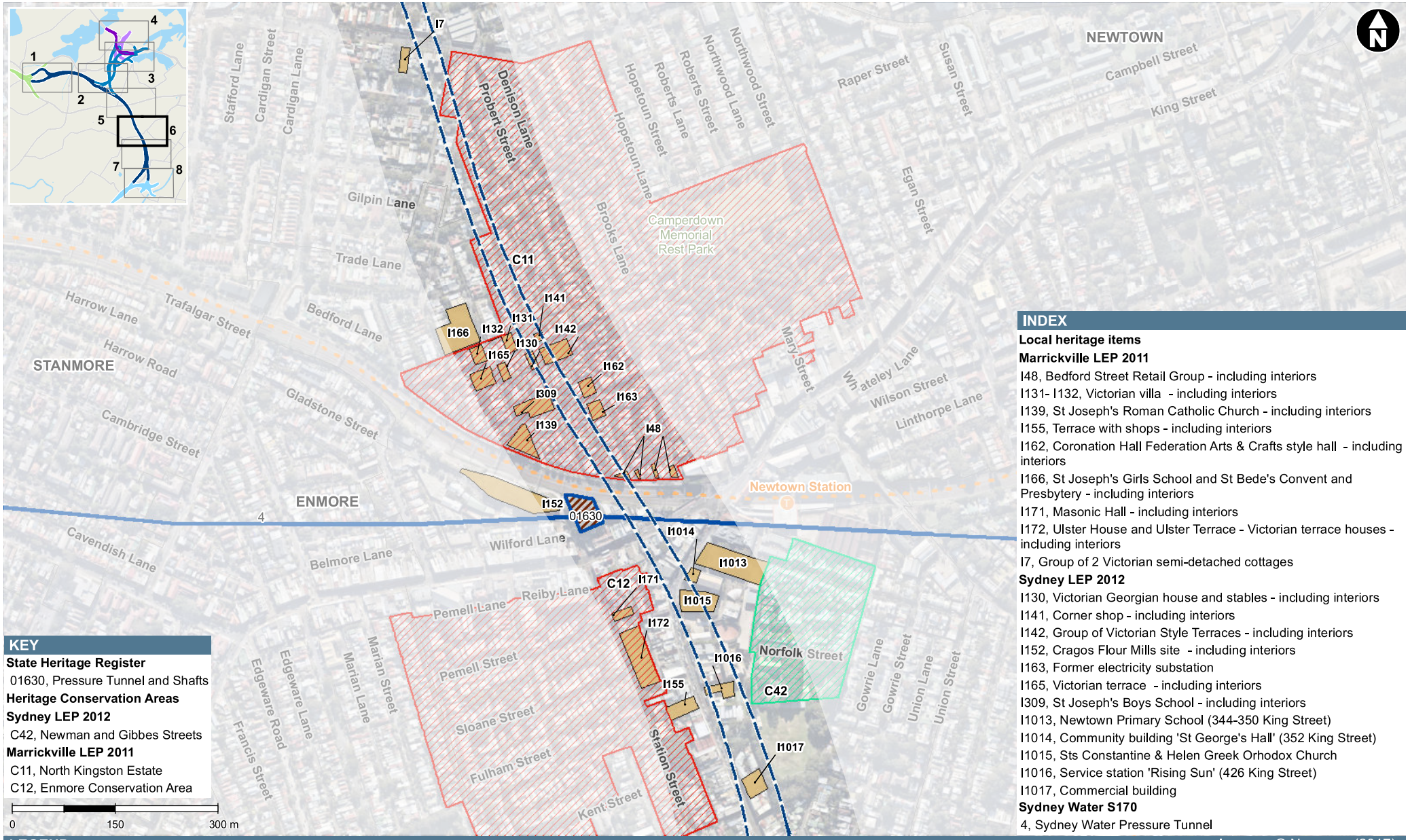
A preliminary assessment of the potential for settlement as a result of the project was undertaken and is described in Chapter 12 (Land use and property) of the EIS. The assessment indicated that settlement would be less than 20 millimetres (which is the most stringent maximum settlement criterion for sensitive receivers proposed for the project) over the majority of the tunnel alignment and in the range of 20 millimetres to 35 millimetres in the following locations:

- North and north west of the Rozelle Rail Yards
- North of Campbell Road at St Peters
- In the vicinity of Lord Street at Newtown.

Settlement is not anticipated to impact heritage items identified along the mainline tunnel alignment given the proposed depth of tunnelling and the generally favourable ground conditions. Where settlement is predicted to exceed accepted settlement criteria a range of measures are available to minimise settlement (refer to section 12.3.4 of the EIS).

Potential heritage impacts due to settlement and ground movement caused by the project will be managed in accordance with the relevant measures identified in **Chapter E1** (Environmental management measures) these include:

- Ground settlement will be managed to comply where possible with the criteria specified in environmental management measure PL6 in **Chapter E1** (Environmental management measures))
- Further assessment of potential settlement impacts, including numerical modelling, will be undertaken based on detailed design. In areas where ground movement in excess of settlement criteria is predicted, an instrumentation and monitoring program to measure settlement, distortion or strain will be implemented. Feasible and reasonable measures would be investigated and implemented to ensure where possible that the predicted settlement is within the criteria (see environmental management measure PL7 in **Chapter E1** (Environmental management measures))
- Settlement monitoring will be carried out for the period in accordance with the program starting prior to commencement of works with the potential to result in ground movement and settlement through to until all settlement has stabilised following completion of tunnel construction (see environmental management measure PL9 in **Chapter E1** (Environmental management measures))
- Building condition surveys will be offered to property owners within the zone of influence of tunnel settlement (50 metres from the outer edge of the tunnels and within 50 metres of surface) or as otherwise directed by the Independent Property Impact Assessment Panel (see environmental management measure PL10 in **Chapter E1** (Environmental management measures))
- In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified (see environmental management measure PL13 in **Chapter E1** (Environmental management measures))
- An Independent Property Impact Assessment Panel will be established prior to the commencement of works with the potential to result in ground movement and settlement or damage due to vibration (see environmental management measure PL11 in **Chapter E1** (Environmental management measures))
- Interface agreements will be entered into with the owners of infrastructure and utility services likely to be impacted by construction of the project (see environmental management measure PL12 in **Chapter E1** (Environmental management measures)).



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Local heritage items

Marrickville LEP 2011

I48, Bedford Street Retail Group - including interiors
I131- I132, Victorian villa - including interiors
I139, St Joseph's Roman Catholic Church - including interiors
I155, Terrace with shops - including interiors
I162, Coronation Hall Federation Arts & Crafts style hall - including interiors
I166, St Joseph's Girls School and St Bede's Convent and Presbytery - including interiors
I171, Masonic Hall - including interiors
I172, Ulster House and Ulster Terrace - Victorian terrace houses - including interiors
I7, Group of 2 Victorian semi-detached cottages

Sydney LEP 2012

I130, Victorian Georgian house and stables - including interiors
I141, Corner shop - including interiors
I142, Group of Victorian Style Terraces - including interiors
I152, Cragos Flour Mills site - including interiors
I163, Former electricity substation
I165, Victorian terrace - including interiors
I309, St Joseph's Boys School - including interiors
I1013, Newtown Primary School (344-350 King Street)
I1014, Community building 'St George's Hall' (352 King Street)
I1015, Sts Constantine & Helen Greek Orhodox Church
I1016, Service station 'Rising Sun' (426 King Street)
I1017, Commercial building

Sydney Water S170

4, Sydney Water Pressure Tunnel

KEY

State Heritage Register

01630, Pressure Tunnel and Shafts

Heritage Conservation Areas

Sydney LEP 2012

C42, Newman and Gibbes Streets

Marrickville LEP 2011

C11, North Kingston Estate
C12, Enmore Conservation Area

LEGEND

Existing features
Railway
Railway station

M4-M5 Link
Mainline tunnel
Tunnel

State Heritage Register
Item

Marrickville LEP 2011
Heritage Conservation Area

Sydney LEP 2012
Heritage Conservation Area
Heritage item

S170 Agency Heritage Register
S170 Sydney Water

Figure C20-1 Heritage items within 100 metres of the project footprint in the vicinity of Newtown Map 6

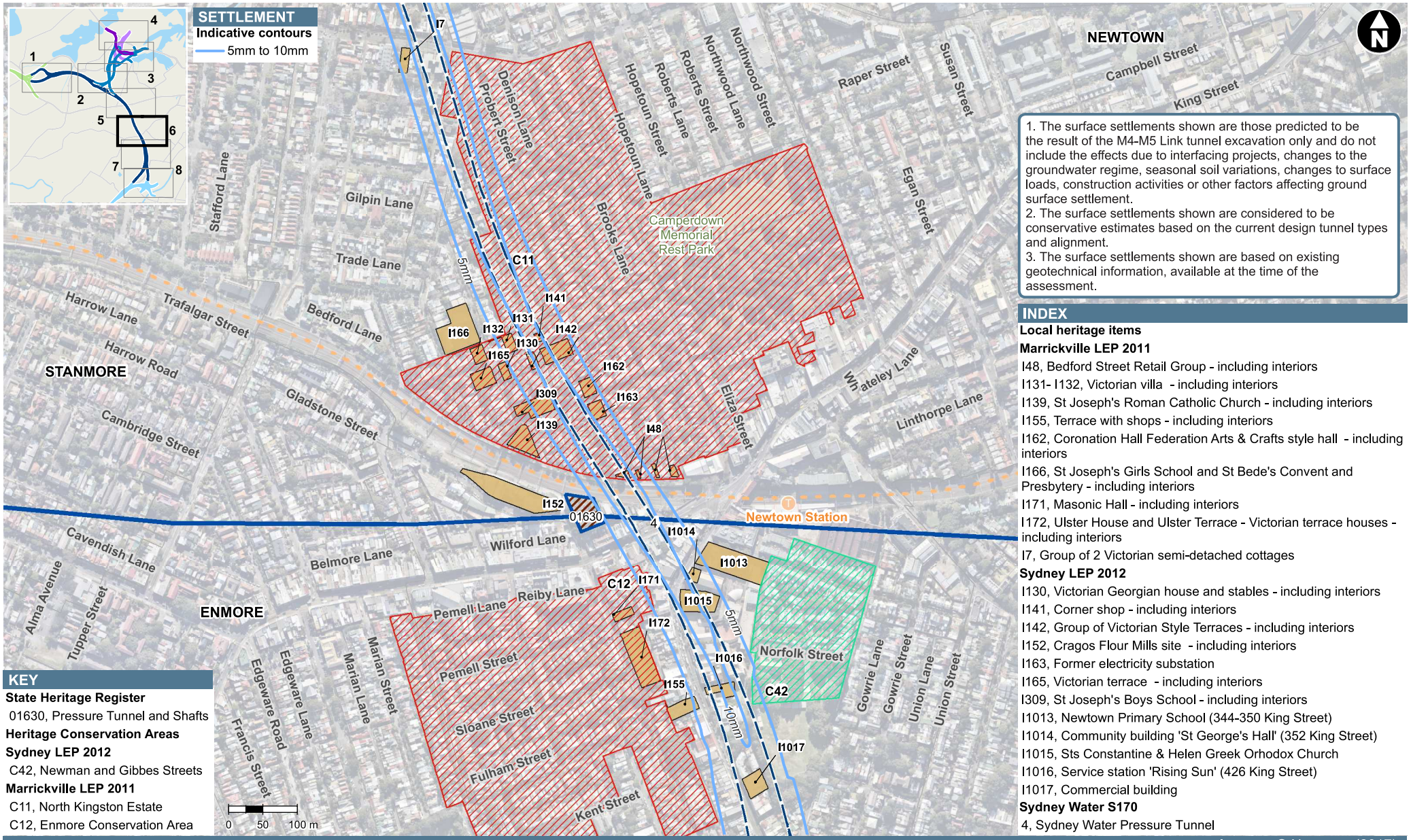

Figure C20-2 Heritage items within 100 metres of the project footprint in the vicinity of the Newtown Map 7

C20.5 Impacts to heritage conservation areas

14 submitters raised concerns about impacts to HCAs. Refer to section 20.3 of the EIS and Chapter 6 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS for details of potential impacts to HCAs.

C20.5.1 Impacts to non-Aboriginal heritage conservation areas

Submitters expressed concern that the construction of the M4-M5 Link could potentially jeopardise the heritage values of HCAs. Specific concerns raised included:

- The proposed ventilation facilities will degrade the heritage value at Rozelle
- Concern that Sydney Motorway Corporation (SMC) and the NSW Government do not comprehend the social, historical and architectural importance of Haberfield's heritage and of the potential destruction of the historical suburb
- Construction sites at Haberfield have the potential to impact on the heritage integrity of Haberfield as a Federation garden and conservation heritage suburb
- Impacts on the heritage integrity of this precinct, which has risen in critical appraisal in the last two decades to 'Ideal Suburb' [Rozelle].

Response

Five HCAs were identified within the study area where surface works associated with the project are proposed, including:

- Haberfield HCA, Haberfield
- Brennan's Estate HCA, Rozelle
- Easton Park HCA, Rozelle
- Hornsey Street HCA, Rozelle
- Iron Cove HCA, Rozelle.

The significance of these HCAs was discussed further in section 6.5 to section 6.10 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS. Potential impacts to HCAs were assessed in section 20.3.2 of the EIS. The outcome of this assessment was presented in Table 20-17 of the EIS.

Impacts associated with the demolition of heritage and contributory items within the Haberfield HCA, and construction of new motorway infrastructure (including the Parramatta Road ventilation facility) at Haberfield under construction scenarios Option A and B, have already been assessed in the M4 East Non-Aboriginal Heritage Impact Assessment (GML 2015) for the M4 East project. No direct impacts to Haberfield HCA are proposed as part of the M4-M5 Link. Visual setting, vibration and settlement impacts to the Haberfield HCA as a result of construction scenarios Option A and B would be negligible.

The project would result in a neutral impact (ie no impact) on the Hornsey Street HCA as the project would involve the demolition of a non-contributory buildings, and visual setting, vibration and settlement impacts to the HCA would be negligible.

The project would result in a neutral impact (ie no impact) on the Iron Cove HCA as visual setting and vibration impacts would be negligible.

The following HCAs would be subject to a minor adverse impact:

- Brennan's Estate HCA
- Easton Park HCA.

Based on the detailed heritage impact assessment in section 6.7.4 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS, the minor adverse impact on Brennan's Estate HCA and Easton Park HCA is a result of vibration, settlement and visual setting impacts from the temporary construction buildings and hoardings, and from permanent above ground infrastructure (including the Rozelle ventilation facility). The Rozelle East motorway operations complex (MOC3) including the ventilations exhaust facility and outlets, substation, water treatment facility and constructed wetland at Rozelle has is sited closer to City West Link away from the HCAs to the north to reduce heritage impacts.

Section 6.7.3 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS assessed the potential impacts of aboveground project infrastructure on the visual setting of HCAs to the north of Rozelle (ie Brennan's Estate and Easton Park HCA). The Rozelle West motorway operations complex (MOC2) including the ventilation supply facility and substation at Rozelle is contained in the motorway operations complex and is sited at the south-western extent of the Rozelle civil and tunnel site and away from the HCAs to the north, adjacent to facilities constructed for the central business district (CBD) and South East Light Rail project. This is to maximise physical and visual separation in an effort to minimise intrusion/impacts on the curtilage and setting of the HCAs to some extent.

Where feasible, the size, form, design and materiality of the proposed ventilation facility, outlets and water treatment plant would be as visually recessive as possible to reduce permanent visual impacts on the HCAs. Urban design and landscaping would also be designed to reduce the prominence of the infrastructure within the overall design of remaining project land.

Management measures to avoid and/or minimise impacts to HCAs through vibration, settlement and visual setting are discussed in **section C20.4.1**.

C20.6 Cumulative non-Aboriginal heritage impacts

99 submitters raised concerns about cumulative non-Aboriginal heritage impacts of the project. Refer to section 26.4 of the EIS and Chapter 7 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS for an assessment of cumulative non-Aboriginal heritage impacts.

C20.6.1 Cumulative impacts to non-Aboriginal heritage

Submitters raised concerns that a number of non-Aboriginal heritage items had already been demolished as part of the WestConnex program of works and were opposed to more non-Aboriginal heritage items being impacted as part of the project. Specific concerns were raised over the cumulative impact on heritage at Concord, Haberfield and St Peters.

A submission acknowledged and concurred with the view that the cumulative impact to heritage has been dramatically reduced by tunnelling and through site selection process for construction areas.

Response

Chapter 7 of Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS assessed the cumulative impact of non-Aboriginal heritage from the WestConnex program of works and other related transport projects. Overall, the cumulative impact of the WestConnex program of works on non-Aboriginal heritage items is considered to be major and irreversible given the scale of WestConnex, primarily resulting from the impacts to the Haberfield HCA from the M4 East project. The M4-M5 Link project has been assessed as resulting in a moderate adverse heritage impact. **Table C20-3** lists the overall heritage impact rating for each WestConnex project.

Table C20-3 WestConnex overall heritage impact ranking

WestConnex project	Overall heritage impact ranking
New M5	Moderate adverse
King Georges Road Interchange Upgrade	Nil
M4 Widening	Nil
M4 East	Major adverse
M4-M5 Link	Moderate adverse

Construction of transport infrastructure projects of this scale in established urban areas will inevitably generate a range of localised impacts. For the WestConnex program of works, one of the unavoidable impacts is the demolition of listed and potential heritage items. Where feasible and reasonable, aboveground motorway infrastructure has been located and designed to reduce heritage impacts.

Cumulative impacts to heritage has been dramatically reduced for the M4-M5 Link by having the majority of the project infrastructure underground and through the site selection process for surface infrastructure and facilities (see **section C20.3.1**).

The heritage impacts from the WestConnex program of works are further addressed and managed through the implementation of a range of environmental mitigation measures including archival recording, heritage interpretation and urban design and landscape initiatives (see **Chapter E1** (Environmental management measures)).

No direct physical impacts would be encountered for the Haberfield HCA during the M4-M5 Link project, but there would be cumulative impacts associated with the continued use of construction ancillary facilities for Option A, and extension of visual impacts on the Haberfield HCA associated with Option B. Heritage impacts at Haberfield have been reduced by reusing construction ancillary facilities from the M4 East project and reducing their footprint (Option A). The Option B sites would have minimal heritage impact.

St Peters would be impacted by the New M5 in addition to the M4-M5 Link. For the area of overlap between the New M5 and the M4-M5 Link projects, no additional property acquisitions or demolitions would be required. The physical separation between the existing and proposed intermediary buildings/structures/landscaping between the motorway operations complex and the heritage items in the vicinity means negligible indirect visual setting impacts would be encountered.

The benefits of each WestConnex component project must be balanced against the impacts, and each project must be able to demonstrate an overall net community benefit. The benefits and impacts of each project were comprehensively assessed in the relevant EIS's and associated technical working papers. Overall, the impacts the M4-M5 Link project is considered to deliver a net community benefit.

The M4-M5 Link project is not expected to result in cumulative impacts at Concord, as Concord is located around 1.9 kilometres from the project footprint.

The submission noting that that the cumulative impact to heritage has been dramatically reduced by tunnelling and through site selection process for construction areas is noted.

C20.7 Non-Aboriginal heritage environmental management measures

195 submitters raised concerns about the environmental management measures for non-Aboriginal heritage impacts. See **Chapter E1** (Environmental management measures) for further details on the non-Aboriginal heritage environmental management measures.

C20.7.1 Non-Aboriginal heritage environmental management measures

Submitters raised concerns and suggested requests regarding the environmental management measures for non-Aboriginal measures. Specific concerns and requests include:

- Lack of functional management plan for the management of heritage houses in the Rozelle interchange construction zone
- Concern that the promise for repairs to be undertaken on heritage buildings is not adequate
- Request that Haberfield be immediately assessed for SHR protection
- Lack of mitigation of construction impacts on heritage buildings at Haberfield
- Concern that the requirement to mitigate impacts is 'where feasible and reasonable', ie not mandatory
- Suggestion that every effort should be made to connect (physically and thematically) the Rozelle Rail Yards recreation area with the rich non-Aboriginal heritage of Callan Park and the Iron Cove foreshore area

- Concern that the development of a HARD would be carried out post-approval, meaning the community would not have input and that community history would be destroyed.

Response

The management measures outlined in **Chapter E1** (Environmental management measures) have been developed to ensure that potential Non-Aboriginal heritage and archaeological impacts are minimised and/or avoided as far as practicable. The management measures include:

- A CHMP will be prepared and implemented as part of the CEMP. The CHMP will include:
  - Measures that will be implemented to manage potential impacts to items of heritage significance
  - Inclusion of heritage awareness and management training for relevant personnel involved in site works
  - Details regarding the conservation and curation of any historical artefacts recovered during works
- An Interpretation Strategy will be developed and implemented to identify and interpret the key heritage values and stories of the heritage areas affected by the project and inform the development of the UDLPs for the project, in accordance with *Interpreting Heritage Places and Items Guideline* (NSW Heritage Office 2005). The Interpretation Strategy will:
  - Build on themes, stories and initiatives proposed as part of other stages of WestConnex to ensure a consistent approach to heritage interpretation for the project
  - Include themes and stories including the Rozelle railways historic functions, trains and trams transport, industrialisation and The Rozelle-Darling Harbour Goods Line
  - Identify how the rail related infrastructure salvaged from the Rozelle Rail Yards will be reused
- Photographic archival recording will be undertaken of:
  - Infrastructure associated with the White Bay Power Station site that could be affected by the project
  - Whites Creek Stormwater Channel (in the area to be impacted)
  - Stormwater Canal off Lilyfield Road
  - 'Cadden Le Messurier' at 84 Lilyfield Road
  - Former Hotel at 78 Lilyfield Road
  - Victoria Road overbridge
  - Each house at 260–266 Victoria Road
  - Each house at 248–250 Victoria Road
  - Former Bank of NSW (164 Parramatta Road).

  It will be undertaken in accordance with the NSW Heritage Office guidelines *Photographic Recording of Heritage Items Using Film or Digital Capture* (2006). The photographic archival recording will occur prior to any works that have the potential to impact upon the items and the report development process will include the identification of appropriate stakeholders to receive copies of the documentation
- As part of the CHMP, a HARD will be prepared before the start of proposed works within each of the following HAMUs: HAMU 3, HAMU 6, HAMU 7, HAMU 10 and HAMU 11. The HARD will be prepared by a qualified archaeologist in consultation with the NSW Heritage Council and will include:
  - Descriptions of clear significance thresholds for possible archaeological items that may be uncovered during works
  - A methodology and scope for a program of archaeological excavation, investigation, and recording of any historical archaeological remains that will be impacted by the project

  - Requirement for post-excavation reporting, including artefact analysis and additional historical research, where necessary, and long term management of records
  - Details of what will happen with any artefacts uncovered and associated reports

- Before excavation of archaeological management sites, a suitably qualified Excavation Director who complies with Criteria for Assessment of Excavation Directors (Heritage Council of NSW 2011) will be engaged to advise on matters associated with historic archaeology. Where archaeological excavation is required, the Excavation Director will oversee excavation and advise on archaeological matters
- Potential vibration impacts to features of heritage significance will be managed in accordance with the CNVMP prepared for the project
- Potential settlement and ground movement caused by the project in the vicinity of heritage items will be predicted based on the detailed design for further numerical modelling and monitored in accordance with the Settlement Monitoring Program
- Any items of potential heritage conservation significance or human remains discovered during construction will be managed in accordance with an Unexpected Heritage Finds and Humans Remains Procedure developed for the project in accordance with relevant guidance provided by the Heritage Council of NSW, the NSW Heritage Division of OEH and the Standard Management Procedure Unexpected Archaeological Finds (Roads and Maritime 2015a). The procedure will detail requirements regarding notification of relevant agencies and the NSW Police and will be implemented for the duration of construction
- A Heritage Salvage Strategy will be prepared to identify the salvage potential of the fabric and features from heritage items and potential heritage items that will be demolished to facilitate the project. This could include timber joinery, fireplaces, stained glass, stairs, decorative tiles, bricks, steel truss structures, windows etc. The strategy will also identify options and a process for dissemination of salvaged items to owners, community groups and interested parties
- Sandstone kerbing in the vicinity of 32 and 34 Victoria Road, Rozelle that will be removed to facilitate the project will be salvaged and provided to Inner West Council
- The potential for impacts to the railway cutting on the eastern side of Victoria Road, associated with the White Bay Power Station, will be considered during the development of the detailed design for the realigned Victoria Road and associated bridge. The final design will seek to avoid impact to the railway cutting and maintain the visual relationship between the cutting and the White Bay Power Station site. Landscaping sympathetic to the relationship, developed in consultation with a heritage specialist, will be included in the UDLPs for the project
- A condition assessment of the southern penstock (and its associated water channels) will be carried out by a heritage specialist and a structural engineer prior to any works in the vicinity with the potential impact upon the item. If required any conservation works required to limit potential impacts on deteriorated fabric (loose bricks, corroded steel) will be identified and implemented prior to construction
- The southern penstock and its associated water channels (location and extent unknown) will be protected during works associated with the reconstruction of the Victoria Road bridge
- A condition assessment of the northern penstock will also be carried out by a heritage specialist and a structural engineer prior to any vibratory works in the vicinity that have the potential to impact on the item. The condition assessment will inform additional management measures to protect the northern penstock, if required. Any conservation works required to limit potential impacts on deteriorated fabric (loose bricks, corroded steel) will be identified and implemented prior to commencement of the relevant vibratory works in the vicinity
- The new bridge over the Whites Creek Stormwater Channel must not impact the extant significant heritage fabric of the channel and should be a solely independent structure
- Landscaping, following the construction of the substation, should consider screening the substation and water treatment plant, from the Leichhardt (Charles Street) Underbridge. The design and location of the landscaping will be informed by a heritage specialist and should seek to create a visual separation between the new structure and the heritage item.

These measures will be subject to assessment by DP&E and approved by the NSW Minister for Planning, who would issue the project conditions of approval. The project must be undertaken in accordance with those conditions and subject to independent audit to ensure compliance. The final management measures will be further refined during detailed design and documented in a CEMP. A CHMP will be prepared and implemented as part of the CEMP to manage potential impacts on items of heritage significance.

Management plan for heritage houses in the Rozelle interchange construction zone

A number of the management measures for Non-Aboriginal Heritage relate directly to the management of impacts as a result of the construction of the Rozelle interchange and the potential heritage items located along Victoria Road that would be fully demolished for the project. See the environmental management measures outlined above.

Repairs for heritage buildings damaged during construction

The noise and vibration assessment in Appendix J (Technical working paper: Noise and vibration) of the EIS assesses minimum working distances for vibration intensive plant. Environmental management measures would be implemented to manage potential vibration impacts to heritage items as described in **section 10.8.5** and **Chapter E1** (Environmental management measures).

In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified.

Assessment of Haberfield for State heritage protection

An assessment to determine whether areas such as Haberfield should be protected on the SHR is beyond the scope of the EIS. The Heritage Division of OEH are responsible for maintaining the SHR and have developed criteria to help establish whether items may be State significant. The Heritage Council of NSW provided comment on the EIS, and these comments have been responded to in **Chapter B7**.

Management of construction impacts at Haberfield

Impacts to heritage during construction at Haberfield are discussed in **section C20.3.1**.

Mandatory nature of management measures

Some environmental management measures would be implemented where ‘feasible and reasonable’ as defined in the EIS. A mitigation measure is ‘feasible’ if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements. A mitigation measure is considered ‘reasonable’ if the overall benefits outweigh the overall adverse social, economic and environmental effects of implementing the measure, including consideration of the cost of the measure.

The identified level of significance for heritage items and conservation areas influences the degree of impact that may be acceptable or the level of investigation and recording that may be required. Consequently, the environmental management measures and recommendations were formulated in accordance with the heritage significance of the listed and potential heritage items and conservations areas.

Interpretation of non-Aboriginal heritage values at Callan Park and Iron Cove

The project does not include a connection between the Rozelle Rail Yards, Callan Park and the Iron Cove foreshore area. An Interpretation Strategy will be developed and implemented to identify and interpret the key heritage values and stories of the heritage areas affected by the project and inform the development of the UDLPs for the project, in accordance with NSW Heritage Office *Interpreting Heritage Places and Items Guideline August 2005* (see environmental management measure NAH02 outlined above and in **Chapter E1** (Environmental management measures) for further detail regarding the Interpretation Strategy).

Preparation of HARD post-approval

The HARD would be prepared before the start of the proposed works to allow for the detailed design of the project to be considered. This would allow for a more accurate methodology and scope to be prepared for a program of archaeological excavation and investigation. This is consistent with the approach adopted for a number of major infrastructure projects in NSW, including other WestConnex projects.

The HARD will be prepared by a qualified archaeologist in consultation with the NSW Heritage Council and will include:

- Descriptions of clear significance thresholds for possible archaeological items that may be uncovered during works
- A methodology and scope for a program of archaeological excavation, investigation, and recording of any historical archaeological remains that will be impacted by the project
- Requirement for post-excavation reporting, including artefact analysis and additional historical research, where necessary, and long term management of records
- Details of what will happen with any artefacts uncovered and associated reports.

See environmental management measure NAH04 outlined above and in **Chapter E1** (Environmental management measures) for further detail regarding the HARD.

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C21 Aboriginal Heritage

This chapter addresses issues raised in community submissions associated with the Aboriginal heritage assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 21 (Aboriginal heritage) and Appendix V (Technical working paper: Aboriginal heritage) of the EIS for further details on the Aboriginal heritage assessment.

Contents

C21.1 Level and quality of assessment

One submitter raised concerns about the level and quality of the Aboriginal heritage assessment. Refer to section 21.1 of the EIS for details of the Aboriginal heritage assessment methodology.

C21.1.1 Adequacy of the Aboriginal heritage assessment

Potential damage to Aboriginal heritage sites along the tunnel alignment and surrounding areas has not been adequately addressed.

Response

The Aboriginal heritage assessment presented in the EIS was carried out in accordance with NSW Roads and Maritime Services (Roads and Maritime)'s *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (2011), and the NSW Office of Environment and Heritage's (OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (NSW Department of Environment, Climate Change and Water 2010). The assessment was undertaken in accordance with the relevant requirements identified in the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning and Environment (DP&E). This involved an assessment of known and potential Aboriginal cultural heritage values relevant to the project footprint and provided appropriate recommendations for any further assessment as well as the identification of appropriate management and mitigation measures.

The assessment also included a review of the Aboriginal Heritage Information Management System (AHIMS) maintained by the OEH. This review did not identify any recorded sites of Aboriginal objects or places within the project footprint. A site inspection, undertaken in conjunction with the Metropolitan Local Aboriginal Land Council, confirmed there were no surface expressions of Aboriginal heritage objects or places within the project footprint. The closest recorded AHIMS site (#45-6-2278, a rockshelter with midden) is located around 50 metres north of the Rozelle Rail Yards. See **section C21.2.1** for further information on potential impacts to AHIMS site #45-6-2278 from the project.

Historically, land use activities within the project footprint have primarily included residential and industrial development. The majority of the ground surface of the project footprint comprises bitumen roads, buildings and concrete. A significant portion of the project footprint is also within disturbed terrain, concentrated with the Rozelle Rail Yards and along watercourses, being areas that have been impacted by past development or other human activity (Australian Soil Classification Soil Type map of NSW (OEH 2014)).

As a result of the project footprint having been heavily disturbed previously, the likelihood of finding intact *in situ* Aboriginal cultural heritage deposits during construction is low. In addition, a large extent of the project (namely the mainline tunnels) is at a depth at which it is unlikely that Aboriginal heritage items would be uncovered.

Nevertheless, in the event that an Aboriginal heritage item is discovered during construction, the Unexpected Heritage Finds and Human Remains Procedure developed for the project would be followed (see environmental management measure AH1 in **Chapter E1** (Environmental management measures)).

C21.2 Impacts on Aboriginal heritage items

84 submitters raised concerns about the impact of the project on Aboriginal heritage items. Refer to section 21.3 of the EIS for an assessment of potential Aboriginal heritage impacts.

C21.2.1 Impacts on Aboriginal heritage items during the construction work

Submitters were concerned that Aboriginal heritage would be impacted by the project during construction. In particular, submitters raised the following issues:

- Concern that the 13 Aboriginal sites within 500 metres of the M4-M5 Link project footprint will be negatively impacted as the specific routes and construction methods are unknown
- Concern with construction on the banks of Whites Creek potentially impacting middens and other Aboriginal heritage items

- Concern with Aboriginal heritage impacts in the inner west area of Sydney
- Concern with the works along Parramatta Road impacting an associated walking route used historically by Aboriginals to access Farm Cove.

Response

The Aboriginal heritage assessment undertaken for the EIS identified known and potential Aboriginal cultural heritage values relevant to the project footprint. A review of the AHIMS maintained by OEH identified no recorded sites of Aboriginal objects or places within the project footprint. The AHIMS search area covered an area of 11 kilometres by nine kilometres, which is larger than the project footprint. The reason for the larger search area was to provide an adequate buffer around the project footprint, understand the spread and distribution of previously recorded Aboriginal sites and to provide context to the project footprint. A site inspection also confirmed there were no surface expressions of Aboriginal heritage objects or places within the project footprint.

Although there are 49 sites identified in the AHIMS search area (refer to Table 21-3 in section 21.2.3 of the EIS), the closest recorded AHIMS site (#45-6-2278, a rockshelter with midden) is located around 50 metres north of the Rozelle Rail Yards, as shown in Figure 21-1 in section 21.1.5 of the EIS, which identifies the AHIMS sites in proximity of the project footprint.

Excavation associated with tunnelling will be required in the general area beneath registered AHIMS site #45-6-2278. Therefore, there is potential for the site to be indirectly impacted from vibration and settlement during construction of the project. However, the site is outside the minimum safe working distance for vibration intensive plant associated with the mainline tunnel works, with vibration impacts associated with tunnelling works expected to be negligible. Environmental management measures AH2 and AH3 (see **Chapter E1** (Environmental management measures)), have been proposed to mitigate potential impacts to this AHIMS site. These include:

- Subject to gaining access from the relevant landholder, a suitably qualified archaeologist would inspect AHIMS site #45-6-2278 prior to the commencement of any vibration intensive construction activities in the vicinity of the site to verify the site and to confirm and record its current condition
- If the AHIMS site #45-6-2278 is verified, an assessment will be completed by a suitably qualified and experienced person prior to the commencement of any vibration intensive construction activities in its vicinity. The assessment will consider all vibration intensive activities that will occur in the vicinity, the likely vibration levels and relevant vibration criteria and identify the management measures, including monitoring, that will be implemented to prevent and reduce potential impacts. A final condition assessment will be carried out at the completion of construction detailing recommendations for remediation measures, if required.

Ground movement is discussed in section 12.3.4 of the EIS. A preliminary assessment of potential ground movement showed that over the majority of the tunnel alignment predicted ground movement is less than 20 millimetres which would be consistent with the most stringent maximum settlement criterion. There are a number of discrete areas, including to the north and northwest of the Rozelle Rail Yards, where ground movement above 20 millimetres is predicted. These discrete areas generally coincide with areas of shallower tunnelling and/or where multiple tunnels are located close to each other. To manage potential impacts from ground movement and settlement, environmental management measures PL7, PL8 and PL9 have been proposed (see **Chapter E1** (Environmental management measures)). These include:

- Further assessment of potential settlement impacts, including numerical modelling, will be undertaken based on detailed design. In areas where ground movement in excess of settlement criteria are predicted, feasible and reasonable measures would be investigated and implemented to ensure, where possible, predicted settlement is within the criteria
- A Settlement Monitoring Program will be prepared which will include settlement criteria and predictions, location and monitoring points, duration of monitoring, data collection, and comparison of actual settlement with predictions and triggers and corrective actions.
- Settlement monitoring will be carried out for the period in accordance with the program starting prior to commencement of works with the potential to result in ground movement and settlement through to until all settlement has stabilised following completion of tunnel construction. The results of settlement monitoring will be compared to predicted settlement. The implementation and adequacy of the Settlement Monitoring Program will be monitored by the Independent Property Impact Assessment Panel.

Section 21.2.4 of the EIS presents the conclusions drawn from site observations regarding the potential for Aboriginal items and/or objects to be present within the project footprint, which are not currently listed in the AHIMS register. If unregistered Aboriginal shell middens were present, they would be most likely to occur in tidal estuarine foreshore zones (within 10 metres of high water level) including areas adjacent to Rozelle Bay, Iron Cove, Whites Creek, Johnstons Creek, Hawthorne Canal (formerly Long Cove Creek) and Alexandra Canal (formerly Sheas Creek). However, it is unlikely that any shell midden sites remain in the project footprint given the high level of disturbance of those areas from activities including vegetation clearance, landscape modification, channelising of creek channels, urban infill, alteration of pre-existing shorelines and road development. In particular, the banks of Whites Creek have been subject to channelisation as it is a concrete lined channel. It is also a heavily disturbed area associated with City West Link and the light rail corridor.

Based on the results of the Aboriginal heritage assessment, impacts on identified objects or places of Aboriginal heritage are considered unlikely. No known, potential or intangible cultural heritage values were identified within the project footprint. No known places of Aboriginal cultural heritage significance would be impacted by the project, and no known archaeological remains are expected to be disturbed. Indirect impacts, such as those resulting from vibration during construction and settlement during operation, are also not anticipated, or are considered to be negligible. Therefore, impacts on Aboriginal heritage would be avoided and no further assessment is required.

The concept design for the project presented in the EIS was assessed using a conservative approach, which included assessing the worst case impacts and scenarios during construction and operation. The design, including tunnels and operational facilities, considered the best available technical information and adopted good practice environmental standards, goals and measures to minimise environmental risks. The detailed design would be reviewed against the concept design, EIS and approval conditions, to determine whether further assessment and/or approval would be required under the *Environmental Planning and Assessment Act 1979* (NSW). If further assessment/approval is required, the applicable statutory process would be followed prior to the commencement of construction of the relevant aspect of the project. However, based on the location of the known AHIMS sites (see Figure 21-1 in section 21.1.5 of the EIS), potential changes to the alignment of the M4-M5 Link would be unlikely to result in direct impacts to AHIMS sites.

In the event that an Aboriginal heritage item is discovered during construction (including shell middens and other Aboriginal heritage items), the Unexpected Heritage Finds and Human Remains Procedure developed for the project, would be followed (see environmental management measure AH1 in **Chapter E1** (Environmental management measures)).

As no AHIMS registered Aboriginal sites occur within the areas of surface disturbance for the project, no known sites would be directly or indirectly impacted by the project.

The corridor that is now Parramatta Road was once utilised by Aboriginal people as a walking track to access the Parramatta area, a section of which was known as Farm Cove. It is considered highly unlikely that the project (including the construction ancillary facilities in the vicinity of Parramatta Road) would impact upon Aboriginal sites along Parramatta Road as it has been subject to high levels of previous disturbance due to the installation of road infrastructure and general urban development.

C21.3 Aboriginal heritage environmental management measures

One submitter raised concerns about Aboriginal heritage environmental management measures for potential Aboriginal heritage impacts. See **Chapter E1** (Environmental management measures) for further details on the Aboriginal heritage environmental management measures.

C21.3.1 Heritage interpretation at Callan Park

A submitter raised concern over the impact of the project on the Aboriginal significance of Callan Park and the Iron Cove foreshore area. The submitter suggests that every effort should be made to connect (physically and thematically) the Rozelle Rail Yards recreation area with the rich Aboriginal heritage of Callan Park and the Iron Cove foreshore area.

Response

The EIS has concluded that the project is not likely to result in impacts to items of Aboriginal cultural heritage significance. Therefore the Interpretation Strategy (see environmental management measure NAH02 in **Chapter E1** (Environmental management measures)) is focused on managing impacts to items of non-Aboriginal heritage significance which are to be potentially impacted by the project.

An Interpretation Strategy will be developed and implemented to identify and interpret the key heritage values and stories of the heritage areas affected by the project and inform the development of the Urban Design and Landscape Plans (UDLPs) for the project, in accordance with the NSW Heritage Office *Interpreting Heritage Places and Items Guideline* (2005). The Interpretation Strategy will build on themes, stories and initiatives proposed as part of other WestConnex component projects to ensure a consistent approach to heritage interpretation for the project. The remaining project land at the Rozelle Rail Yards would be subject to the relevant UDLP (and therefore the Interpretation Strategy) for the project. UDLPs for the project will be prepared in consultation with relevant local councils and the community.

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C22 Greenhouse gas

This chapter addresses issues raised in community submissions associated with the greenhouse gas (GHG) assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 22 (Greenhouse gas) and Appendix W (Detailed greenhouse gas calculations) of the EIS for further details on the GHG assessment.

Contents

C22.1 Level and quality of greenhouse gas assessment

115 submitters raised concerns about the GHG assessment. Refer to section 22.1 and Appendix W (Detailed greenhouse gas calculations) of the EIS for a detailed description of the GHG assessment methodology.

C22.1.1 Inadequate assessment of greenhouse gas emissions

Submitters have raised concerns that the impacts of GHG emissions have not been adequately assessed, including long-term impacts on climate change. Specific concerns included:

- The EIS has not responded to the global threat of climate change and does not demonstrate how the project will contribute to climate change, through GHG emissions generated by traffic, and provides no serious case of how it will be responsive to mitigating against future climate change
- The claim of reduced emissions from vehicles is selective and not credible
- Rail transport (passenger and freight) and surface road options should have been included in the assessment for a comparison of total energy consumption over the life of the project
- The assessment was based on flawed traffic modelling (WestConnex Road Traffic Model version 2.3 (WRTM v2.3))
- The EIS has not properly assessed the cumulative impacts on GHG emissions in the 2033 scenario. If free flow traffic conditions do not occur, the modelled greenhouse gas outcomes could be significantly different
- Emissions were not modelled beyond 2033, even though the contractual life of the project is until 2060. Therefore the longer outcome of the project is likely to increase GHG emissions
- The EIS concludes that the 2023 'With project' scenario would increase net GHG emissions and the 2023 'Cumulative' scenario would have a net decrease of GHG emissions. However, as the 2023 'Cumulative' scenario includes the proposed future Sydney Gateway and Western Harbour Tunnel projects, which are neither planned nor approved, the 2023 'With project' scenario should be considered as a likely outcome, which would mean an increase in emissions would occur.

Response

Contribution to global climate change

The project's impact on future climate change is through the emission of GHG. Chapter 22 (Greenhouse gas) and Appendix W (Detailed greenhouse gas calculations) of the EIS provide an estimate of the project's contribution to climate change through an assessment of GHG emissions attributed to the project's construction, operation and use.

While the effects of climate change vary based on local context, the cause of anthropogenic climate change, being the increased generation and concentration of GHG emissions in the atmosphere, occurs on a global scale. The global nature and long lag times associated with climate processes means that the contribution of GHG emissions from one project cannot be attributed to local changes in climate. As a result, the estimate of GHG emissions generated by the project is considered as a contribution to global climate change. Climate change impacts on the project and adaptation measures to respond to climate change risks are addressed in Chapter 24 (Climate change risk and adaptation) of the EIS.

As discussed in section 22.2 of the EIS, mitigation of GHG emissions is addressed through international, national and state policy frameworks including the Kyoto Protocol (United National Framework Convention on Climate Change (UNFCCC) 2012), the Paris Agreement (UNFCCC 2015), the Australian Government's Direct Action Plan, Emissions Reduction Fund (Australian Government Clean Energy Regulator), the NSW Government's Climate Change Policy Framework (NSW Office of Environment and Heritage (OEH) 2016) and NSW Government Resource Efficiency Policy (OEH, 2014). The *NSW Long Term Transport Master Plan* (*Transport Master Plan*) (Transport for NSW 2012) and *Transport for NSW Environment and Sustainability Policy Framework* (2013) also include provisions for improved energy efficiency and a reduction in GHG emissions. The project has been developed in line with targets identified in these policy frameworks, and the WestConnex Sustainability Strategy, to reduce the project's contribution to global GHG emissions.

Road transport emissions account for approximately 15 per cent of Australia's annual GHG emissions, with 80.8 million tonnes of carbon dioxide equivalent (t CO_2-e) released annually (based on data in the 2015 National Inventory Report (Australian Government 2017). The GHG assessment undertaken for the project demonstrates the benefits of road tunnel usage in urban areas, where travel along a more direct route at higher average speeds results in fewer GHG emissions being generated by road users, as reduced congestion and stop-start driving improves the fuel efficiency of vehicles. Despite increases to overall daily vehicle kilometres travelled on motorways and a reduction in performance of some non-motorway roads, a reduction in annual GHG emissions is estimated as a result of the project compared with the 'Do minimum' traffic modelling scenario (refer to section 22.4 of the EIS).

Management measures to further reduce the GHG emissions from the project are detailed in **Chapter E1** (Environmental management measures).

Assessment of alternative modes of transport

Chapter 4 (Project development and alternatives) of the EIS describes the alternatives that were considered during development of the project, and explains how and why the project was selected as the preferred option. Alternatives considered included rail transport (passenger and freight) and improvements to surface roads within the existing arterial road network.

Section 4.4.2 of the EIS recognises that the WestConnex program of works is part of a broader integrated transport solution for the management of freight and passenger movements, as one of more than 80 projects outlined in the *Transport Master Plan* to address the state's complex transport needs. As part of a broader integrated transport and land use solution, WestConnex supports a coordinated approach to the management of freight and passenger movements, and is complementary to other modes of transport including rail, bus, ferries, light rail, cycling and walking. However, as discussed in the EIS, Sydney's freight, commercial and services tasks require distribution of goods and services across the Sydney basin, which relies on more diverse and dispersed point-to-point transport connections that can only be provided by the road network.

The GHG assessment therefore does not compare GHG emissions of the project with alternative modes, since these modes are intended to be complementary, rather than exclusive. Development of alternative modes would be subject to separate environmental assessment and planning approvals, as required.

GHG assessment methodology

The methodology for the GHG assessment described in section 22.1 of the EIS has been based on relevant GHG reporting legislation and international reporting guidelines, including:

- *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard* (World Council for Sustainable Business Development and World Resources Institute 2004)
- *National Greenhouse and Energy Reporting Act 2007* (Commonwealth)
- AS ISO 14064.1:2006 *Greenhouse Gas Part 1: Specification with guidance at the organisational level for quantification and reporting of greenhouse gas emissions and removals*
- The current Australian National Greenhouse Accounts: *National Greenhouse Accounts Factors* (NGA Factors) (Australian Government Department of the Environment, 2015a)
- *Greenhouse Gas Assessment Workbook for Road Projects* (the TAGG Workbook) (Transport Authorities Greenhouse Group (TAGG) 2013).

The TAGG Workbook provides a consistent methodology for estimating the GHG emissions from activities that may contribute significantly to the overall emissions associated with the construction, operation and maintenance of road projects. The TAGG workbook has been adopted for the project.

To calculate the potential GHG emissions associated with the project, the following steps were followed:

- Define the assessment boundary and identify potential sources of GHG emissions associated with the project
- Determine the quantity of each emission source (fuel and electricity consumed, vegetation cleared, construction materials used and waste produced)
- Quantify the potential GHG emissions associated with each GHG source using equations and emission factors specified in the NGA Factors and the TAGG Workbook.

Appendix W (Detailed greenhouse gas calculations) of the EIS provides a detailed description of the GHG assessment methodology, including the emissions factors used for emission sources, and detailed calculation methods used to estimate the GHG emissions from fuel combustion, electricity consumption, vegetation clearing, materials use and the decomposition of waste.

As discussed in Appendix W (Detailed greenhouse gas calculations) of the EIS, it was necessary to define a study area for the assessment of Scope 3 road use emissions, to determine the changes in daily traffic volumes and performance on the road network (both increases and decreases) as a result of the project. As the project would not replace a single existing route within the road network, the GHG study area boundary was selected to include key routes that currently serve as alternate routes to the project as well as other roads within the vicinity that were considered to be influenced by the project.

These key routes for the GHG study area boundary were identified in accordance with Appendix H (Technical working paper: Traffic and transport) of the EIS, using:

- Difference plots from WRTM v2.3 – the difference plots showed the percentage change in traffic flows between different road network scenarios and confirmed the study area would cover the material changes in traffic volumes as a result of the project
- Screenline analyses – used to examine how traffic patterns may change between the alternative parallel corridors through the study area. Four screenlines were selected to analyse directional and two-way traffic volume outputs from the different modelling scenarios for each common future year.

Assessment of operational and cumulative GHG emissions using traffic modelling

Chapter C8 (Traffic and transport) provides responses to issues raised relating to the adequacy of the methodology for the traffic forecasts and modelling. The traffic and transport assessment for the project utilised an industry standard strategic transport model administered by NSW Roads and Maritime Services. An integral part of the traffic modelling process was the involvement of independent expert peer reviewers to examine model development, traffic forecasts and associated methodologies. It is therefore considered that the traffic model comprised the best available input for calculating GHG emissions from vehicles. Concerns with regards to the traffic modelling undertaken for the project are discussed in **Chapter C8** (Traffic and transport).

The assessment of operational impacts was based on the timeframes adopted for the traffic modelling, which aimed to make best use of available traffic count data and modelling software to determine base and future traffic conditions for the project and surrounding road network (in terms of estimating travel demand and traffic volumes). These traffic conditions were then used to assess the operational performance of the network, in scenarios with and without the project. Traffic volumes were modelled for 2023 and 2033 consistent with Appendix H (Technical working paper: Traffic and transport) of the EIS. These future years were chosen as they provide an indication of road network performance at project opening (2023) and 10 years after opening (2033).

Estimation of GHG emissions beyond 2033 is not considered appropriate for a number of reasons, including:

- Traffic forecasts beyond the operational traffic impact footprint for the project, which was assessed up to 2033, were not available
- There is significant uncertainty in the prediction of conditions beyond 2033, including traffic forecasts, vehicle efficiencies and fuel mixes

- To extrapolate data using the average emissions interpolated between 2023 and 2033 would not provide a credible estimate of annual emissions.

Discussion provided in section 22.5 of the EIS acknowledges that savings in emissions would reduce over time as traffic volumes increase in line with forecast population growth. However, improvements in fuel efficiency and increased uptake of vehicles which do not release GHG emissions, including electric vehicles, are likely to offset some of the increased emissions due to increased traffic volumes.

Chapter 22 (Greenhouse gas) of the EIS acknowledges that the magnitude of greenhouse gas emissions savings for the 'Cumulative' scenarios is likely to be attributable not only to an increase in average speeds, but also to a reduction in the number of vehicles using roads within the study area, as alternative routes become available with the completion of the WestConnex program of works and other major transport infrastructure projects in Sydney. This conclusion is consistent with the future forecast traffic performance of the study area as identified in Appendix H (Technical working paper: Traffic and transport) of the EIS.

C22.2 Greenhouse gas emissions during construction

One submitter raised concerns about GHG emissions during construction. Refer to section 22.3 of the EIS for details of potential GHG impacts during construction.

C22.2.1 Project would increase greenhouse gas emissions from construction activities

A submitter raised concerns that construction activities would exacerbate the effects of global warming by generating GHG emissions through vehicle use and the use of large quantities of concrete.

Response

Key GHG emissions sources during construction of the project are summarised in Table 22-2 and Table 22-3 and shown in Figure 22-1 of the EIS.

GHG emissions generated during project construction would occur once and are estimated at around 500,000 t CO_2-e. As discussed in section 22.5 and shown in Figure 22-2 of the EIS, the one-off emissions generated during construction and the annual operation and maintenance emissions for the project would be offset against emissions savings from improved road performance within the study area boundary in the 2023 and 2033 cumulative and 2033 'With project' scenarios compared with the 'Do minimum' scenario.

As described in section 22.3.3 of the EIS, the GHG emissions calculations for the project demonstrated that the majority of GHG emissions associated with the construction of the project are attributed to indirect Scope 3 emissions (around 60 per cent). Scope 3 emissions during construction include upstream/downstream emissions generated in the wider economy due to third party supply chains and the transportation of materials, spoil and waste to/from, and around, the project footprint.

The embodied energy associated with the offsite mining, production and transport of materials that would be used for the construction of the project contributes the largest proportion of indirect Scope 3 emissions, accounting for around 89 per cent of these emissions. The use of concrete, cement and, to a lesser extent, steel would contribute significantly to Scope 3 emissions.

The GHG assessment was based on a conservative approach, in line with relevant GHG reporting legislation and international reporting guidelines including the *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard* (World Council for Sustainable Business Development and World Resources Institute 2004). The detailed GHG calculations (refer to Appendix W of the EIS) provide the assumptions that were used to inform the assessment of GHG emissions, with conservative emissions factors and default quantity factors used where inputs were unavailable or unknown during preparation of the EIS.

Chapter E1 (Environmental management measures) provides a list of measures that will be implemented to further reduce GHG emissions during construction of the project. Measures to reduce the carbon footprint of the project during construction include:

- Selection of low emission construction materials, where feasible
- Use of recycled content road construction materials, such as recycled aggregates in road pavement and surfacing, where feasible

- Construction plant and equipment will be operated and maintained to maximise efficiency and reduce emissions
- Selection, where feasible and reasonable, of construction plant and equipment that has the highest fuel efficiency or that uses lower GHG intensive fuel such as biofuels (eg biodiesel, ethanol)
- Procurement of locally produced goods and services, where feasible and cost effective, to reduce transport fuel emissions
- Energy efficient systems will be installed where reasonable and practicable
- At least 20 per cent of construction energy (electricity) required for the project will be sourced from renewable energy generated onsite and/or from an accredited GreenPower energy supplier, where possible. At least six per cent of construction energy (electricity) use will be offset, with any offset undertaken in accordance with the Australian Government National Carbon Offset Standard.

Environmental management measures for construction are described in full in **Chapter E1** (Environmental management measures).

C22.3 Greenhouse gas emissions during operation

287 submitters raised concerns about GHG emissions during operation. Refer to section 22.4 of the EIS for details of potential GHG impacts during operation.

C22.3.1 Project would increase greenhouse gas emissions during operation

Submitters have raised concern that the project would increase GHG emissions, consume fuel resources and contribute to global warming thereby exacerbating climate change. In particular submitters raised the following issues:

- The project would exacerbate the effects of global warming through vehicle emissions (from induced traffic demand and congestion on arterial roads at either end of the mainline tunnels) and use of fossil fuels
- Savings in emissions from improved road performance would reduce over time as traffic volumes increase
- Increased carbon emissions and high per-capita GHG emissions
- The project does not meet Australia's commitment to reduce GHG emissions under the Paris Agreement.

Response

The estimated GHG emissions that would be generated by vehicles using the M4-M5 Link are presented in Table 22-6 of the EIS. Annual emissions from vehicles have been calculated according to the GHG assessment methodology summarised in section 22.4.2 of the EIS and the assumptions and inputs provided in Appendix W (Detailed greenhouse gas calculations) of the EIS. As described in Chapter 6 of Appendix W (Detailed greenhouse gas calculation) of the EIS, the GHG assessment of Scope 3 road use operational emissions was based on an assessment of the changes in traffic and network performance on the road network in the vicinity of the M4-M5 Link project, for a number of future modelled scenarios. In summary, the project would result in total annual road user emissions of 46,886 t CO_2-e per year in 2023 and 54,686 t CO_2-e per year in 2033, representing approximately five per cent of the operational road use GHG emissions in the existing road network within the study area.

The GHG assessment demonstrates the benefits of road tunnel usage in urban areas, where travel along a more direct route at higher average speeds results in fewer GHG emissions being generated by road users, as reduced congestion and stop-start driving improves vehicle fuel efficiency. Despite increases to overall daily vehicle kilometres travelled on motorways and a reduction in performance of some non-motorway roads, a reduction in GHG emissions is estimated as a result of the project compared with the 'Do minimum' traffic modelling scenario.

The GHG assessment assessed both the emissions associated with the M4-M5 Link project and the 'Cumulative' scenario'. Table 22-6 of the EIS notes that the project will result in annual savings of 361,581 t CO_2-e across the existing road network and the M4-M5 Link compared to the 'Do minimum (without project)' scenario in 2023 and annual savings of 504,751 t CO_2-e in 2033 compared to the 'Do minimum' scenario. When the cumulative scenario is considered, these savings increase to 602,501 t CO_2-e annually in 2023 and 821,128 t CO_2-e in 2033. The predicted reduction in GHG emissions as a result of the project would be due to an improvement in vehicle fuel efficiency for some links within the study area as well as the operational efficiency of the project tunnels.

The discussion provided in section 22.5 of the EIS acknowledges that savings in emissions would reduce over time as traffic volumes increase in line with forecast population growth. However, improvements in fuel efficiency and increased uptake of vehicles which do not release GHG emissions, including electric vehicles, are likely to offset some of the increased emissions due to increased traffic volumes.

Chapter 24 (Climate change risk and adaptation) of the EIS assesses the effect of global warming on the project and identifies adaptation measures to respond to future climate change. The Australian Government's commitments under the UNFCCC Paris Agreement are outlined in section 22.2 of the EIS, including aims to reduce Australia's GHG emissions by creating positive incentives to adopt better technologies and practices.

The design of the project has already considered measures to reduce energy and resource requirements, and therefore GHG emissions. These include (but are not limited to):

- Reducing the length of the mainline tunnels, thereby reducing the lighting and ventilation required, and emissions generated from operational road use by vehicles
- Reduced power consumption through the design of the ventilation system, which incorporates low pressure fans that consume approximately 50 per cent less energy compared with a high pressure fan solution.

An Energy Efficiency and Greenhouse Gas Emissions Strategy and Management Plan (GHG1) will be prepared to identify initiatives to be implemented during operation of the project to improve energy efficiency, reduce GHG emissions, energy use and embodied life cycle impacts (see **Chapter E1** (Environmental management measures)).

In addition, as discussed in section 4.4.2 of the EIS, by reducing surface road traffic along sections of Parramatta Road and Victoria Road, the project would facilitate potential future developments in public transport, which are acknowledged to have lower per-capita GHG emissions compared with private vehicle use. The project would also deliver new and improved active transport links within residual land created by the project such as within the Rozelle Rail Yards and along the south side of Victoria Road.

Environmental management measures for operation are described in full in **Chapter E1** (Environmental management measures).

C22.4 Greenhouse gas environmental management measures

63 submitters raised concerns about management of greenhouse gas emissions. See **Chapter E1** (Environmental management measures) for GHG environmental management measures.

C22.4.1 Targets for renewable energy and carbon offsets

Submitters were concerned that the targets for renewable energy supply and carbon offsets (refer to Table 22-8) were not clear and not aligned with NSW Government policy.

Response

As described in section 22.7.2 of the EIS, mitigation measures will be incorporated during the construction and operation of the project to further reduce GHG emissions generated by the project, in accordance with the WestConnex Sustainability Strategy (Sydney Motorway Corporation 2015).

The WestConnex Sustainability Strategy outlines a sustainability vision, commitments, guiding principles, objectives and overarching targets across a range of sustainability themes, and was prepared to align with the *Transport for NSW Environment and Sustainability Policy Framework* (Transport for NSW 2013g) as well as other relevant government sustainability instruments. These instruments include those specific to GHG emissions and energy use, being the NSW Government *Resource Efficiency Policy* (OEH 2014c) and the *NSW Climate Change Policy Framework* (OEH 2016a), as described in the section 27.2 of the EIS. The *NSW Government Resource Efficiency Policy* (OEH 2014c) aims to drive resource efficiency, with a focus on energy, water and waste, and a reduction in harmful air emissions. The project electricity targets align with the NSW Government *Resource Efficiency Policy* of sourcing a minimum of six per cent of electricity from an accredited GreenPower energy supplier. Carbon offsets will be undertaken in accordance with the Australian Government National Carbon Offset Standard.

The *NSW Climate Change Policy Framework* (OEH 2016a) aims to maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate. As part of the implementation of this framework, two additional draft plans have been released for public consultation, including the *Draft Climate Change Fund Strategic Plan 2017–2022* which sets out priority investment areas for funding over the next five years to prepare NSW for a changing climate, and the *Draft Plan to Save NSW Energy and Money* (OEH 2016c) which is proposed to meet the NSW Government's energy efficiency target of 16,000 gigawatt hours of annual energy savings by 2020, and contribute to achieving net zero emissions by 2050.

The *Draft Plan to Save NSW Energy and Money* outlines the preferred options for achieving the state's energy savings target, including a proposal to investigate opportunities to implement minimum energy standards or benchmarks for State significant developments (SSD) and major infrastructure projects. The draft plan provides examples of the energy savings that could be achieved, such as standards that require new SSD and major infrastructure projects to consume 10 per cent less energy per year than similar existing projects. As part of this proposal, the NSW Government will conduct further analysis to (OEH 2016c):

- Improve the baseline for SSD and major infrastructure energy consumption and costs to better determine achievable energy savings
- Determine what energy savings requirements could feasibly be realised from different project types (for example, railways and motorways)
- Determine how individual project needs should be reflected in these requirements
- Assess which is the best mechanism to introduce standards.

Public consultation for the draft plan was undertaken between 3 November and 16 December 2016. Based on the feedback received, the NSW Government is currently developing a new action plan for national leadership in energy efficiency.

An Energy Efficiency and Greenhouse Gas Emissions Strategy and Management Plan will be prepared for the project as part of the project's Sustainability Management Plan (see environmental management measure GHG1 in **Chapter E1** (Environmental management measures)). This plan would incorporate new policy guidance and revise energy efficiency targets, where required.

Environmental management measures for construction and operation are described in full in **Chapter E1** (Environmental management measures).

C23 Resource use and waste minimisation

This chapter addresses issues raised in community submissions associated with the resource use and waste minimisation assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 23 (Resource use and waste minimisation) of the EIS for the further details on resource use and waste minimisation.

Contents

C23.1 Level and quality of resource use and waste minimisation assessment

43 submitters raised concerns about the quality of the resource use and waste minimisation assessment. Refer to section 23.1 of the EIS for details of resource use and waste minimisation assessment methodology.

C23.1.1 Level and quality of the resource use and waste minimisation assessment

Submitters raised concern about the adequacy of the resource use and waste minimisation assessment in the EIS. Specific concerns included:

- An inadequate calculation of the volume of surplus spoil to be removed, including for the Rozelle interchange
- Request for a verified calculation of the total amount of spoil to be removed to be undertaken
- Insufficient detail on the methodology for removing contaminants from the Rozelle Rail Yards
- NSW Roads and Maritime Services (Roads and Maritime) fails to explain how contaminants removed from the tunnel water, collected at permanent water treatment plants (specifically at the Darley Road facility), will be disposed of and what conditions would apply to its treatment and disposal. Roads and Maritime fails to assess the risk of these contaminants which will be generated by the project
- Spoil haulage has a high environmental impact and the failure to describe the impacts of each the possible spoil haulage options is a serious omission in the EIS.

Response

Spoil estimates presented in the EIS considered the construction of tunnels to accommodate up to four lanes of traffic in each direction and large underground interchanges (the Inner West subsurface interchange and the Rozelle interchange). Up to about 4,000,000 cubic metres of spoil would be generated during construction of the project. Waste types, anticipated quantities of waste and resource use estimates would be revised by the successful construction contractors during the detailed design of the project and would be finalised as part of the detailed construction planning and during construction.

Indicative quantities and types of waste that would be generated from the project were estimated in the EIS based on a concept design for the project. This information formed the basis for the preliminary classification in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste* (NSW Environment Protection Authority (NSW EPA) 2014).

A contamination assessment was undertaken in Chapter 16 (Contamination) of the EIS, which identified soil and groundwater contamination at the Rozelle Rail Yards. The methodology and strategies for removing contaminated spoil and preventing cross-contamination at the Rozelle Rail Yards would be in accordance with NSW EPA requirements. Procedures for handling and storing potentially contaminated substances will be detailed in the Construction Waste Management Plan (CWMP) as part of the Construction Environmental Management Plan (CEMP).

Waste from the operation water treatment plant, based on the current reference design which assumes total suspended solids removal, pH adjustment and iron and manganese treatment, is described below:

- Waste sludge containing sediment, iron and manganese, caustic soda, polyaluminium chloride, coagulant polymers and flocculent polymers
- The sludge would need to be disposed of as inert solid waste to a general landfill
- Likely volume would be about one skip bin monthly.

Wastewater from the tunnels would be treated prior to discharge into the stormwater network. Water collected within the tunnels not suitable for treatment would be discharged to the local sewer system or disposed of at an appropriate waste facility. Water treatment and discharge criteria are discussed in **section C15.5**.

Potential environmental impacts associated with spoil haulage are considered throughout the environmental assessment including in Chapter 8 (Traffic and transport), Chapter 9 (Air quality) and Chapter 10 (Noise and vibration) of the EIS. The disposal and use of construction spoil is discussed in **section C23.2.1**. Measures to manage impacts associated with spoil haulage are provided in **Chapter E1** (Environmental management measures).

C23.2 Spoil handling and management

Three submitters raised concerns about spoil handling and management. Refer to section 23.3 of the EIS for details of spoil management.

C23.2.1 Disposal and use of construction spoil

Submitters raised concern about the incorrect disposal and use of construction spoil. Specifically, submitters were concerned that there has been inadequate planning for the safe haulage and disposal of spoil.

Response

The project design presented in the EIS has taken into account the principles of the resource management hierarchy as defined in the *Waste Avoidance and Resource Recovery Act 2001* (NSW) (WARR Act), including minimising excess spoil generation, as far as practical. As described in section 23.3.2 of the EIS, where possible and fit for purpose, spoil would be beneficially reused as part of the project before alternative spoil reuse or disposal options are pursued. Excess spoil which cannot be reused or recycled would be disposed of at a suitably licensed waste facility in accordance with NSW EPA requirements. The project would seek to reuse or recycle around 95 per cent of uncontaminated spoil, either within the project or at other locations. **Table C23-1** lists the potential sites for receipt of spoil which cannot be reused within the project.

Table C23-1 Potential spoil management sites

Spoil management site	Location	Distance from the project (kilometres)	Capacity for site to accept spoil (cubic metres)
Horsley Park (manufacturing facility)	Wall Grove Road at Horsley Park	About 40	Capacity for entirety of project spoil generation[1]
Blacktown Waste Services (landfill)	920 Richmond Road at Marsden Park	About 45	250,000
Sakkara Development (industrial estate)	Riverstone Parade at Riverstone	About 45	3,500,000
Kurnell Landfill	330 Captain Cook Drive at Kurnell	About 20	7,000,000
Moorebank Intermodal Terminal Precinct	Moorebank Avenue, Moorebank	About 30	2,500,000
Western Sydney Airport	Lot 1 DP 838361, Badgerys Creek	About 50	Capacity not known at this stage

Note:
1 The Horsley Park spoil management site is a manufacturing facility and currently does not have a definitive limit for the amount of spoil it can receive.

Spoil would be delivered to the spoil management sites in accordance with the conditions of planning approvals and any environment protection licences governing those sites. The spoil reuse and disposal sites identified above are based on the current existing availability of spoil receiving locations (including projects with a fill deficit) across the Sydney area. Construction of the project would occur over a five-year period, with spoil generation peaking in 2019-2021 when both the mainline tunnels and Rozelle interchange are under construction concurrently. It is therefore anticipated that alternative locations may emerge during construction that could represent an improved outcome.

The following criteria would be applied to determine the priority given to the identified spoil reuse and disposal sites, including how much spoil would be sent to each site, and to evaluate any additional spoil reuse or disposal options that emerge during construction:

- Economic – feasibility of transporting the spoil compared to the options already identified, including consideration of the distances to be travelled
- Approvals – any receiving location would need to be approved to receive the applicable type and volume of spoil
- Traffic impacts – with a preference for haulage routes that keep to major arterial roads and minimise total haulage requirements as far as possible
- Environmental benefit – in terms of a preference for the material to be reused for such purposes as:
  - Environmental works (eg coastal protection works, flood mitigation or restoration)
  - Clean fill on other projects (eg landscaping, barrier mounds, land reclamation, capping)
  - Land restoration (eg filling of disused mines and quarries).

Spoil would be hauled using heavy vehicles to spoil reuse and disposal sites. The construction traffic and transport assessment has taken into account heavy vehicle movements associated with spoil management during the peak construction period. Chapter 8 (Traffic and transport) of the EIS provides a summary of heavy vehicle movements at each construction ancillary facility, including spoil related haulage. Spoil would be transported from construction ancillary facilities to spoil management locations, generally along arterial roads and the M4 East Motorway, the New M5 Motorway, the M5 East Motorway and the M5 South West Motorway. Construction traffic routes for the project would use the existing motorway and arterial road network as much as possible, reducing traffic related impacts on local roads. Environmental management measures will ensure safe haulage such as identifying and communicating haulage routes, along with site access requirements and restrictions, to all spoil haulage drivers (see **Chapter E1** (Environmental management measures)).

Indicative haulage routes from the construction ancillary facilities are shown in section 6.6.5 of the EIS. Where reuse is not possible, disposal of spoil would be the last resort. **Table C23-1** lists the potential sites that have been identified for receiving excess spoil from the project. Negotiations for the final destination(s) for excess spoil would be carried out during detailed design. In addition, there is the potential that spoil could be removed by barge, subject to further investigations. Spoil haulage routes would be confirmed during detailed design and will be documented in the Construction Traffic and Access Management Plan (CTAMP) for the project.

C23.3 Waste management (other than spoil)

113 submitters raised concerns about the management of wastes other than spoil. Refer to section 23.3 of the EIS for details of construction waste management and 23.4 for operational waste management.

C23.3.1 Handling, transport and disposal of contaminated waste generated during construction

Submitters raised concerns about the disposal of contaminated waste generated during construction. Concerns include:

- Risk to the community from removal, transfer and handling of contaminated material (including asbestos, metals and hydrocarbons) from the Darley Road civil and tunnel site (C4), a known contaminated site
- Option B construction ancillary facilities at Haberfield/Ashfield pose a risk to the health and welfare of the community, as a result of possibly contaminated soil particles coming off of trucks leaving the sites.

Response

Various waste streams would be generated during construction of the project, including construction and demolition waste, vegetation waste, packaging materials, liquid wastes and contaminated materials. All waste would be managed in accordance with the waste provisions contained within the *Protection of the Environment Operations Act 1997* (NSW) and, where reused off-site, would comply with relevant NSW EPA resource recovery exemptions and requirements.

Asbestos and other contaminants are likely to be located within the project footprint, as discussed in Chapter 16 (Contamination) of the EIS. The Darley Road civil and tunnel site (C4) has been assessed as a medium contamination risk, as investigations have identified contaminants as present in the area. All proposed options for construction ancillary facilities at Haberfield and Ashfield have also been assessed and range from low to medium risk. Exposure to contaminants during construction may result in health risks for construction workers and people in neighbouring communities. Environmental management measures to manage potential risks related to contaminated materials include the development and implementation of a Work Health and Safety Plan, incorporating asbestos handling and management measures. Potentially contaminated areas directly affected by the project will be investigated and managed in accordance with the requirements of guidance endorsed under section 105 of the *Contaminated Land Management Act 1997* (NSW). If contamination posing a risk to human or ecological receptors is identified, a Remediation Action Plan will be prepared.

Material that is identified as contaminated will be segregated from uncontaminated material on site to prevent cross-contamination. The CWMP will describe methodologies and strategies to prevent cross-contamination. Strategies to transport and dispose of the contaminated materials would be also detailed in the CWMP, including ensuring contaminated waste is properly contained and secured during transport and transported by appropriate persons in accordance with requirements of the *Protection of the Environment Operations Act 1997* (NSW) and in particular the Protection of the Environment Operations (Waste) Regulation 2014 (NSW). As described in section 23.3.2 of the EIS, suitable areas will be identified to allow for contingency management of unexpected waste materials. Suitable areas will be hardstand or lined areas that are appropriately stabilised and bunded, with sufficient area for stockpile storage and segregation. All vehicle loads with the potential to result in dust generation will be covered during transport in accordance with relevant road regulations (see environmental management measure AQ15 in **Chapter E1** (Environmental management measures)).

A proposed new haulage route for the Darley Road civil and tunnel site (C4) is described in **section C4.18**. Haulage routes for other construction ancillary facilities, including those proposed at Haberfield and Ashfield, are described in section 6.6.5 of the EIS. Spoil haulage routes would be confirmed during detailed design and will be documented in the CTAMP for the project.

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C24 Climate change risk and adaptation

This chapter addresses issues raised in community submissions associated with the climate change risk and adaptation assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 24 (Climate change risk and adaptation) and Appendix X (Climate change risk assessment framework) of the EIS for the further detail on the climate change risk and adaptation assessment.

Contents

C24.1 Level and quality of climate change risk and adaptation assessment

Two submitters raised concerns about the quality of the climate change risk and adaptation assessment. Refer to section 24.1 of the EIS for details of the climate change risk and adaptation assessment methodology.

C24.1.1 Level and quality of climate change risk and adaptation assessment

Submitters raised concern over the level, quality and scope of the climate change risk assessment. Specific concerns included:

- Use of a 100 year average return interval (ARI) for flood modelling and concern that this does not account for an increase in the frequency of severe weather events due to climate change
- Risks from sea level rise due to climate change were not adequately assessed and no mitigation for these risks has been included
- Ignoring parameters other than temperature and rainfall eg groundwater recharge, sea level rise and rainfall intensity. This should be corrected given the low lying land and drainage basin function of the Rozelle Rail Yards. The EIS should be revised to include more severe events than it currently anticipates
- The climate change risk assessment should be independently reviewed by experts in the international insurance industry.

Response

The climate change risk and adaptation assessment was prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) to assess the risk and vulnerability of the project to climate change in accordance with relevant guidelines, quantify specific climate change risks and incorporate specific adaptation actions in the design to improve the project's resilience to climate change.

The assessment adopted the approach of the *Technical Guide for Climate Change Adaptation for the State Road Network* (NSW Roads and Maritime Services (Roads and Maritime) (unpublished) 2015) and was conducted in line with key international, national and industry standards and guidelines, including:

- The risk assessment approach set out in *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines* and *ISO/IEC 31010 Risk Management – Risk assessment techniques*
- *AS 5334-2013 Climate change adaptation for settlements and infrastructure – A risk based approach*, which follows *AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines*
- *Australian Government, Climate Change Impacts & Risk Management – A Guide for Business and Government* (Australian Government 2006)
- *Guideline for Climate Change Adaptation*, Revision 2.1 (Australian Green Infrastructure Council 2011)
- *Guidelines for Risk Management* (Roads and Maritime 2014).

Climate change projections adopted for the risk assessment were based on information published by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Australian Bureau of Meteorology (BOM) in 2015 using the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5), as recommended in the draft *Technical Guide: Climate Change Adaptation for the Road Network* (Roads and Maritime (unpublished) 2015). These projections have used the representative concentration pathway (RCP) 8.5 which projects up to four degrees Celsius by 2100. Projections provided by CSIRO and BOM were considered the most appropriate for the project as they include projections for all climate change variables relevant to the project, including changes to temperature and rainfall, as well as extreme temperature, extreme rainfall, wind speed, bushfire weather, sea level rise, extreme sea levels and storm surge and increases in atmospheric carbon dioxide.

It was considered prudent to include the potential impact of sea level rise on the project, given the project's proximity to the coastline, particularly at Rozelle Bay, and the sensitivity of road infrastructure to inundation impacts.

An alternative source of climate change projections was available from the NSW and the Australian Capital Territory (ACT) Regional Climate Modelling (NARCliM) project (2014), which was published in collaboration with NSW Office of Environment and Heritage (OEH). These projections provide downscaled climate change data for a 10 kilometre resolution specific to NSW and the ACT. However, as discussed in section 24.2.2 of the EIS, while both sets of projections provide robust information on possible changes to the NSW climate, NARCliM projections are not yet available for a number of key climate variables (extreme rainfall, sea level rise, storm surge, wind speed), are based on earlier climate models used for the IPCC's Fourth Assessment Report (AR4), and the 'far future' projections are limited to the period 2060 to 2079. This presented limitations when considering potential climate change impacts on road planning and design, particularly the potential impacts of sea level rise on the project.

The difference between the sources of projections is not considered to have impacted the development of risk scenarios for the project. A review of the climate change risk assessment by the international insurance industry is not considered necessary as AECOM's team includes practitioners that have provided climate advisory services to the insurance sector. Furthermore, the insurance industry has an opportunity to review and provide comments on the EIS as part of the public exhibition.

Consideration of climate change in flood modelling

The climate change risk and adaptation assessment was also prepared in accordance with the SEARs for flooding, taking into account the projected changes in sea level rise and storm intensity due to climate change.

As discussed in section 24.4 of the EIS, key climate change risks for the project are associated with an increase in the intensity of extreme rainfall and sea level rise, which are likely to exacerbate the existing flood risk experienced in some project locations, particularly the intersection of The Crescent and City West Link at Rozelle. In order to assess the impact of climate change on flood behaviour, sensitivity analyses were undertaken for increases in extreme rainfall and sea level rise, with design refinements made to manage potential flood risks and flood risks likely to be exacerbated by climate change.

As discussed in Chapter 17 (Flooding and drainage) and Appendix Q (Technical working paper: Surface water and flooding) of the EIS, the flood modelling undertaken for the project considered the impact of climate change on rainfall using the approach recommended in the *Practical Considerations of Climate Change – Floodplain Risk Management Guideline* (NSW Department of Environment and Climate Change 2007). This approach recommends sensitivity testing of increases in rainfall intensities above the 100 year return interval of between 10 and 30 per cent. As discussed in section 24.2.2 of the EIS, sensitivity testing of the project's design was undertaken against the 200 year and 500 year ARI design rainfall intensities as, under present day climatic conditions, increasing the 100 year ARI design rainfall intensity by 10 per cent would produce about a 200 year ARI event and increasing the 100 year ARI design rainfall intensity by 30 per cent would produce about a 500 year ARI event. Results of sensitivity testing for increases in rainfall intensities are presented in Appendix Q (Technical working paper: Surface water and flooding) of the EIS.

Flood modelling for the project also adopted a conservative approach for sensitivity testing of future sea level rise. Sensitivity testing was undertaken for up to 0.9 metres of sea level rise, which is slightly more conservative compared with the current CSIRO and BOM (2015) projections for Sydney, which project up to 0.88 metres of sea level rise by 2090 under a 'High' emissions scenario. Results of sensitivity testing for sea level rise are presented in Appendix Q (Technical working paper: Surface water and flooding) of the EIS.

Adaptation to respond to climate change risks

As discussed in section 24.5 of the EIS, adaptation measures were incorporated in the project's design to respond to potential risks from climate change.

The EIS acknowledges the low-lying nature of the Rozelle Rail Yards and its susceptibility to increases in extreme rainfall and sea level rise due to climate change. As discussed in section 24.4 of the EIS, key climate change risks for the project are associated with an increase in the intensity of extreme rainfall and sea level rise, which are likely to exacerbate the existing flood risk experienced in some project locations, particularly the intersection of The Crescent and City West Link at Rozelle.

To address these risks, the project's design incorporated a number of adaptation actions (refer to section 24.5.1 of the EIS). These included incorporation of constructed wetland and bioretention treatment facilities, design of landscape topography to act as additional waterways and flood storage, consideration of increased flows in the design of surface connections and tunnel portals, upgrade of existing road infrastructure susceptible to flooding, and increasing the capacity of White's Creek to accommodate increases in flood events and rises in sea levels.

Adaptation actions were also identified for additional climate change risks. Consideration of increased extreme heat events was incorporated into the urban design of project surface infrastructure and areas of open space created by the project, including landscaped areas to increase shading and areas of respite and reduce the absorption of heat by infrastructure, where possible.

During detailed design, a detailed climate change risk assessment would be undertaken in accordance with the standard *AS 5334-2013 Climate change adaptation for settlements and infrastructure - A risk based approach*, informed by the initial climate change risk assessment set out in Chapter 24 (Climate change risk and adaptation) of the EIS. During detailed design, adaptation options for the specific risks associated with infrastructure components of the project would be identified and implemented where appropriate.

C24.2 Impacts from climate change

13 submitters raised concerns about the impacts from climate change during construction and operation. Refer to section 24.3 and 24.4 of the EIS for details of impacts from climate change during construction and operation.

C24.2.1 Impact of sea level rise on the project

A submitter was concerned that there has been little to no consideration of sea level rise when choosing the location for major infrastructure for this project. The submitter questions how it is justifiable for major infrastructure be built on low lying land, some of which has been recognised as flood prone land near Rozelle Bay, given that climate change is to be considered in planning and development decisions under the *Environmental Planning and Assessment Act 1979* (NSW).

Response

For the development of new infrastructure, such as the M4-M5 Link project, a climate change risk assessment identifying potential risks and recommending adaptation measures is considered the appropriate approach to managing climate risks at this stage of the project. The preliminary climate change risk assessment undertaken for the EIS was carried out in accordance with relevant industry standards and assessment guidelines and in accordance with the *Technical Guide for Climate Change Adaptation for the State Road Network* (Roads and Maritime (unpublished) 2015).

As discussed in section 24.4.1 of the EIS, a total of 33 direct and indirect climate change risks to the project were identified. Of these risks, one extreme, four high and 12 medium risks were identified for the project's operation.

The EIS acknowledges the low-lying nature of the Rozelle Rail Yards and its susceptibility to increases in extreme rainfall and sea level rise due to climate change. As discussed in section 24.4 of the EIS, key climate change risks for the project are associated with an increase in the intensity of extreme rainfall and sea level rise, which are likely to exacerbate the existing flood risk experienced in some project locations, particularly the intersection of The Crescent and City West Link at Rozelle.

In order to assess the impact of climate change on flood behaviour, sensitivity analyses were undertaken for increases in extreme rainfall and sea level rise, with design refinements made to manage potential flood risks and flood risks likely to be exacerbated by climate change.

The climate change risk assessment included as part of the project's EIS would inform a detailed climate change risk assessment to be undertaken during detailed design, in accordance with *AS 5334-2013 Climate change adaptation for settlements and infrastructure - A risk based approach*. The assessment will identify and implement adaptation measures to address high and extreme risks, which would be factored into the detailed design as appropriate. The decision to implement adaptation measures for medium risks will also be considered during detailed design.

Management of potential impacts

Adaptation measures incorporated in the project design during EIS preparation were associated with broader design refinements and opportunities for optimisation, with consideration given to avoiding, minimising or managing risks from future climate change, where possible (refer to section 24.5.1 of the EIS).

To address key risks from extreme rainfall and sea level rise, the project's design incorporated a number of adaptation actions (refer to section 24.5.1 of the EIS), including incorporation of a constructed wetland and bioretention treatment facilities, design of landscape topography to act as additional waterways and flood storage, consideration of increased flows in the design of surface connections and tunnel portals, upgrade of existing road infrastructure susceptible to flooding, and increasing the capacity of Whites Creek to accommodate increases in flood events and rises in sea levels.

Adaptation actions were also identified for additional climate change risks, including consideration of increased extreme heat events through the urban design of project surface infrastructure and areas of open space created by the project, consideration of power consumption and redundancy in the event of a power outage and the long term performance and durability of structures in the context of a changing climate. These design refinements are discussed further in section 24.5.2 of the EIS.

Section 24.5.2 of the EIS listed recommended next steps for the development of adaptation options to be further considered during detailed design and the further detailed climate change risk assessment. These next steps became the proposed environmental management measures for climate change impacts and are summarised in **Chapter E1** (Environmental management measures).

C24.2.2 Urban heat island effect

Submitters were concerned over the role of the project in contributing to the urban heat island effect. Specific concerns included:

- The reduced vegetation cover and the broad heat sink created by the project may increase the heat load and burden on the suburbs, as it has done at Haberfield/Ashfield. Delays in restoring Urban Design and Landscape Plan (UDLP) lands, with consequent delays in restoring aspects of the street tree canopy will exacerbate this problem
- Large areas of sealed surfaces produce urban heat and contribute to global warming
- The cumulative costs of continued urban motorway developments on human health, including health impacts due to extreme summer temperatures, exacerbated by the urban heat island effect
- The project will increase the urban heat island effect which will enforce higher costs on households through increased requirements for cooling and energy use
- The ability of the city to manage urban heat is greatly reduced by removing vegetation
- Urban heat poses risks to public health and puts critical infrastructure at risk, resulting in cost increases in other areas (ie health).

Response

Urban areas, comprising a greater density of hard surfaces such as roads, pavements and buildings, absorb and retain more heat compared with areas of natural land cover. This is known as the urban heat island (UHI) effect and results in increased average temperatures experienced within areas of high urban development. The UHI effect is also related to the urban canyon effect, where the narrow arrangement of buildings in urban areas restricts wind flows which assist with cooling. Increased temperatures in urban areas can have negative effects on human health, plants, and animals, and can impact on the efficiency and performance of critical infrastructure and services.

The UHI effect is not considered to contribute directly to global warming. However, the UHI effect results in localised warming around urban centres and is likely to be exacerbated by increasing temperatures due to climate change. This in turn may result in increased requirements for cooling and energy use associated with air conditioning.

The majority of the project is located underground in tunnels or involves replacing existing hard surfaces with new hard or previously cleared surfaces. As a result the project is considered to have only a minor impact on the UHI effect in the long term.

In the short term, around 4.49 hectares of vegetation is proposed to be removed during construction activities. This vegetation predominantly comprises urban native and exotic vegetation and may result in highly localised impacts (in terms of UHI effect) to residents directly adjacent to the vegetation, mostly due to the loss of shade that the trees provided.

The EIS arborist report (refer to Annexure G of Appendix S (Technical working paper: Biodiversity Assessment Report) of the EIS) noted that around 1,675 trees, predominantly around the Rozelle Rail Yards and within land owned by the Port Authority of NSW, are proposed to be removed, although the project will seek to retain as many trees as possible. As discussed in **section B11.18.3**, the project has committed to a tree replacement strategy as reflected in the environmental management measure B6 (see **Chapter E1** (Environmental management measures)). In addition, the project has committed to providing up to 10 hectares of public open space.

Section 5.5.6 of Appendix L (Technical working paper: Urban design) of the EIS identifies the UHI effect as an element of the water sensitive urban design principles to be considered during the finalisation of the UDLPs for the project (see environmental management measure UD1) through:

- Maximising irrigation of green spaces to reduce local temperatures
- Retaining water and maximising areas of open water and marshlands to provide cooling
- Maximising the use of trees and irrigating them to encourage quick growth to establish the tree canopy
- Selecting pavement designs which can reduce the UHI effect and maximise cooling, where possible.

Roads and Maritime acknowledges the City of Sydney Council and the former Marrickville Council's involvement with 2020 Vision, a commitment to achieve a 20 per cent increase in green space in urban areas by 2020, and will consult with councils during the development of UDLPs and the provision of public open space for areas within their respective local government boundaries.

As discussed in section 24.5 of the EIS, consideration of increased extreme heat events due to climate change has been incorporated into the urban design of project surface infrastructure and areas of open space created by the project, including landscaped areas to increase shade and areas of respite and reduce the absorption of heat by infrastructure, where possible.

Responses to issues related to the project's contribution to climate change (in the form of GHG emissions) are discussed in **Chapter C22** (Greenhouse gas). Responses to human health and biodiversity issues are discussed in **Chapter C11** (Human health risk) and **Chapter C18** (Biodiversity), respectively.

C25 Hazard and risk

This chapter addresses issues raised in community submissions associated with the hazard and risk assessment for the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 25 (Hazard and risk) of the EIS for the further detail on the hazard and risk assessment.

Contents

C25.1 Level and quality of hazard and risk assessment

One submitter raised concerns about the quality of the hazard and risk assessment. Refer to section 25.1 of the EIS for details of the hazard and risk assessment methodology.

C25.1.1 Level and quality of hazard and risk assessment

A submitter suggests that the EIS needs to assess the long term risk identified with transportation of hazardous materials on surface roads, since transport of these substances will be excluded from the tunnels, in the context of proposed urban renewal of Parramatta Road and various parts of the Inner West Council area. The submitter suggests that rail freight transport might be a safer option for the transport of dangerous goods.

Response

Significant controls are placed on the transport of dangerous goods by road, which are set out in legislation including the *Work Health and Safety Act 2011* (NSW), *Dangerous Goods (Road and Rail Transport) Act 2008* (NSW), Dangerous Goods (Road and Rail Transport) Regulation 2014 (NSW) and relevant Australian Standards. The NSW Government also has a number of long term freight strategies to reduce the amount of surface road freight and to move more freight onto rail, including the *NSW Freight and Port Strategy* (Transport for NSW 2013).

No hazardous materials would be transported in the project tunnels as they would be listed as a prohibited area under Road Rules 2014 – Regulation 300-2: NSW rule: carriage of dangerous goods in prohibited areas (Regulation 300-2) (NSW). Regulation 300-2 does not allow dangerous goods and hazardous substances to be transported within prohibited areas. The risk from the transport of hazardous materials along existing surface roads would not be increased as a result of the project. The M4-M5 Link would not result in a change of current practices where dangerous goods are already transported on surface roads. Surface roads and infrastructure have been designed to provide an efficient and safe road network.

An Incident Response Plan will be developed as part of the Emergency Response Plan for the project and implemented in the event of an accident or incident (see **Chapter E1** (Environmental management measures)). Therefore, it is not anticipated that there will be any long term adverse impacts associated with the transportation of hazardous materials as result of the project. While dangerous goods can be transported by rail, it is likely that there would still be demand for the transport of dangerous goods by road.

C25.2 Dangerous goods and hazardous substances impacts

Three submitters raised concerns about impacts from dangerous goods and hazardous substances. Refer to sections 25.1 and 25.2 of the EIS for further information on storage, handling and transport of dangerous goods and hazardous substances.

C25.2.1 Transportation of dangerous goods and hazardous substances during construction

Submitters raised concerns about transportation of dangerous goods and hazardous substances. Specific concerns included:

- Request for detailed plans for contaminated soil movements from Rozelle by route and time, with evidence to ensure residents will not be impacted during construction
- Concern about the transportation of dangerous goods and hazardous substances used on the project via the Pyrmont Bridge Road tunnel site (C9).

Response

Section 25.1.2 of the EIS provides an assessment of potential impacts during construction of the project as a result of the transportation of dangerous goods and hazardous substances. Some dangerous goods and hazardous substances will be required to be transported to the construction ancillary facilities, including the Pyrmont Bridge Road tunnel site (C9). Potential hazards and risks associated with the transportation of dangerous goods and hazardous substances have been considered by comparing the type, quantity and frequency of dangerous goods and hazardous substances with the thresholds presented in the State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33 Guidelines).

The transportation of dangerous goods and hazardous substances during construction will be managed to avoid impacts from spills or leaks by measures including (see **Chapter E1** (Environmental management measures):

- Transport of dangerous goods and hazardous substances will be conducted in accordance with relevant legislation and codes, including the Dangerous Goods (Road and Rail Transport) Regulation 2014 (NSW) and the Australian Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission 2008) (see environmental management measure HR5 in **Chapter E1** (Environmental management measures))
- Safety Data Sheets for dangerous goods and hazardous substances will be stored on site prior to their arrival (see environmental management measure HR4 in **Chapter E1** (Environmental management measures)).

There is potential for heavy metals such as lead and other potential contaminants to exist at the Rozelle civil and tunnel site (C5), given the various historical land uses of the Rozelle Rail Yards. Material that is identified as contaminated will be segregated from uncontaminated material on site to prevent cross-contamination. A Construction Waste Management Plan (CWMP) will be prepared as part of the Construction Environmental Management Plan for the project. The CWMP will describe methodologies and strategies to prevent cross-contamination and for the transport and disposal of contaminated materials, including ensuring contaminated waste is properly contained and secured during transport and transported by appropriate persons in accordance with requirements of the *Protection of the Environment Operations Act 1997* (NSW) and in particular the Protection of the Environment Operations (Waste) Regulation 2014. These measures will ensure residents will not be impacted by the mobilisation of contaminated materials and this is further discussed in **Chapter C16** (Contamination).

Indicative spoil haulage routes would be confirmed during detailed design and construction planning. However, the indicative haulage routes are outlined in **Table C25-1**. Spoil haulage from the Pyrmont Bridge Road tunnel site (C9) is proposed to occur 24 hours per, seven days per week as identified in Table 6-27 of the EIS.

Table C25-1 Indicative spoil haulage routes

Location		Indicative spoil haulage route
C1a	Wattle Street civil and tunnel site[1]	• Entry: via the Wattle Street interchange entry ramp • Exit: via the Wattle Street interchange exit ramp and onto Parramatta Road, heading west
C2a	Haberfield civil and tunnel site[1]	• Entry and exit via the M4 East tunnel connection
C3a	Northcote Street civil site	No spoil haulage would occur from this site
C1b	Parramatta Road West civil and tunnel site	• Entry: eastbound along the M4 Motorway, southbound along Centenary Drive, eastbound along the Hume Highway, then left onto Parramatta Road heading north • Exit: northbound along Parramatta Road
C2b	Haberfield civil site	No spoil haulage would occur from this site
C3b	Parramatta Road East civil site	No spoil haulage would occur from this site
C4	Darley Road civil and tunnel site[2]	• Entry: eastbound along City West Link, James Craig Road, westbound on City West Link and then left into James Street • Exit: westbound along City West Link
C5	Rozelle civil and tunnel site[1]	• Entry: eastbound along City West Link and into the site • Exit: westbound along City West Link
C6	The Crescent civil site	• Entry: City West Link, then south along The Crescent and into the site • Exit: northbound along The Crescent (to be facilitated via construction traffic management measures), then City West Link
C7	Victoria Road civil site	No spoil haulage would occur from this site
C8	Iron Cove Link civil site	• Entry: northbound along Victoria Road and into the site • Exit: northbound along Victoria Road
C9	Pyrmont Bridge Road tunnel site[1]	• Entry: eastbound along Parramatta Road and into the site • Exit: westbound along Pyrmont Bridge Road and then Parramatta Road
C10	Campbell Road civil and tunnel site[1]	• Entry: southbound along Campbell Road and then into the site • Exit: northbound along Campbell Road, then south along the Princes Highway

Note:
1 Indicative spoil haulage routes may vary based on the final construction methodology and program.
2 The proposed haulage route has been amended since the exhibition of the EIS. See **section C4.18.1** for more information.

C25.2.2 Transport of dangerous goods and hazardous substances during operation

A submitter is opposed to surface roads (including local streets) being used to transport hazardous materials instead of through the tunnels as this would in turn create traffic issues such as increase in number of vehicles, truck movements and noise in local areas.

Response

As with all other road tunnels in Sydney (including the M5 East tunnel), vehicles carrying dangerous goods and hazardous substances would not be permitted to use the M4-M5 Link tunnels as the tunnels are prohibited areas under Regulation 300-2 (see **section C25.1.1**).

It is considered unlikely that the prohibition of these vehicles in the tunnels would lead to an increase in their proportion on other roads beyond that attributable to general traffic growth. Vehicles carrying dangerous goods would likely continue to use existing surface freight routes.

C25.3 Aviation risks

One submitter raised issues with aviation risks. Refer to sections 25.1 and 25.2 of the EIS for details of potential aviation risks during construction and operation.

C25.3.1 Management of aviation risks

A submitter supported the management of aviation risks in the EIS, specifically the commitment that lighting during construction would adhere to established guidelines.

Response

The support for the project commitment to the management of aviation risks is noted.

C25.4 Other potential hazard and risk impacts

14 submitters raised concerns about other potential hazard and risk impacts. Refer to section 25.1 and 25.2 of the EIS for details of potential hazard and risk impacts during construction and operation.

C25.4.1 Risks associated with incidents and emergencies in the tunnels

Submitters raised concerns about risks associated with incidents and emergencies in the tunnels. Specific concerns included the consideration of safety features and lack of design surrounding access to emergency escape points within the Rozelle interchange tunnels and mainline tunnels, particularly when a traffic incident, fire, bomb or terrorist attack occurs in the tunnel.

Response

Section 25.2.4 of the EIS provides an assessment of the potential impacts during operation as a result of incidents in the tunnels.

All roads carry an inherent risk of vehicle collision associated with its operation. The project has been designed to provide for efficient, free-flowing traffic with physical capacity to accommodate the forecast traffic volumes. The design has incorporated all feasible and reasonable design measures in relation to geometry, pavement, breakdown bays, lighting and signage. The design is consistent with current Australian Standards, road design guidelines and industry best practice, inherently minimising the likelihood of incidents and crashes.

Some of the key tunnel features designed to minimise the likelihood of incidents and crashes and manage those that occur include:

- Vehicle height detection system prior to the tunnel entry portals
- Tunnel barrier gates to prevent access in the event of tunnel closure
- Closed-circuit television (CCTV) throughout the tunnel and approaches
- Adjustable speed signs

- Appropriately spaced breakdown bays and emergency telephones.

The project has also been designed to meet appropriate fire and life safety requirements in the event of an incident or accident in the tunnel (as described in Chapter 5 (Project description) of the EIS). Consultation has been undertaken and would be ongoing with Fire and Rescue NSW and other emergency services to ensure the fire and life safety requirements are achieved.

Each project tunnel would be one-directional, reducing the risk of crashes through head-on collisions and simplifying smoke management and egress requirements. The transport of dangerous goods and hazardous substances would be prohibited through the mainline tunnels and entry and exit ramps, reducing the risk of very large fires or the release of toxic materials in the tunnel.

Other fire and life safety aspects that would be incorporated into the project include:

- State of the art CCTV and audible systems to detect incidents and manage evacuation processes
- Pedestrian cross-passages between the mainline tunnels and longitudinal egress passages along the entry and exit ramps, to allow pedestrians to exit the tunnel and ramps in the event of a major incident. Cross-passages would cater for egress for people with disabilities; therefore, stairs or ramps with steep grades would be limited, or alternative safe holding zones would be provided where necessary
- Automatic fire and smoke detection within the tunnels
- Longitudinal ventilation to 'push' smoke in the direction of traffic flow away from the fire source towards a ventilation facility or tunnel portal
- A water deluge system that could be activated manually or automatically at the fire source
- Structures, linings and services that would be fire hardened to protect them from fire damage before the activation of the deluge system, or if the deluge system fails.

The likelihood of a fire during operation of the project cannot be entirely removed. Uncontrollable human factors inherently lead to a risk of incidents and crashes, although the likelihood of such events is low and the consequence of such incidents is reduced through the provision of fire safety systems within the tunnels.

In the event of an incident, approaching traffic would be prevented from entering the mainline tunnels. Vehicle occupants at the location of the fire and upstream of the fire source would be instructed to stop their vehicles, and exit in the opposite direction through the section of carriageway that would be protected by the smoke management system, or through an exit door to a cross-passage leading to the other ('non-incident') mainline tunnel, which is fire and smoke separated from the incident tunnel.

Occupants downstream of the fire source would be encouraged to continue driving out of the tunnel. If this is not possible and they are forced to evacuate on foot, egress would be provided via an exit door to a cross-passage leading to the non-incident mainline tunnel. Emergency services would be able to reach the fire source via the non-incident tunnel (by foot or in some cases by vehicle), or from the upstream direction in the affected tunnel (by foot).

An Incident Response Plan will be developed as part of the Emergency Response Plan for the project and will be implemented in the event of an accident or incident. The response to incidents within the motorway would be managed in accordance with the memorandum of understanding between Roads and Maritime and the NSW Police Service, NSW Rural Fire Service, NSW Fire Brigade and other emergency services.

The tunnels would have some resilience to bomb/terrorist attack and the safety measures described above will reduce the impact of these types of events. However, due to the variable nature of these events, reliance is placed on other dedicated government agencies with regard to dealing with such incidents.

C25.4.2 Safety hazards

A submitter raised a concern regarding the potential for unsafe demolition methods which could pose a serious risk to public safety, including to the Rozelle Public School. A submitter was also concerned about potential safety breaches at the Pyrmont Bridge Road tunnel site such as asbestos and/or other hazardous materials or substances emanating from the site and affecting the Malt Shovel Brewery's patrons and workers.

Response

Section 25.1.3 of the EIS discusses the safety hazards of the project, including risks associated with demolition such as exposure to airborne pollutants such as asbestos fibres. During construction and demolition activities, airborne pollutants have the potential to be generated, including dust and toxic gas. If this were to occur, it may result in oxygen deficient or toxic environments and other potential health risks for construction workers and local community members. See **Chapter C9** (Air quality) for issues raised regarding potential air quality impacts, including for Rozelle Public School.

Some dangerous goods and hazardous substances will be used at the Pyrmont Bridge Road tunnel site (C9). Section 25.1.2 of the EIS outlines the dangerous goods and hazardous substances that would be transported to and used/stored at construction ancillary facilities. Management measures will be implemented to reduce the risk of impact on safety to the local community, including storage of dangerous goods and hazardous materials in accordance with suppliers' instructions and relevant Australian Standards and legislation (see **Chapter E1** (Environmental management measures)). Any incident would be managed in accordance with the Incident Response Plan for the project, which will outline notification protocols to neighbouring properties and emergency services in the event of a serious incident.

Environmental management measures to be implemented to reduce these risks are discussed in **section C25.5.1**.

C25.4.3 Risks to nuclear facilities

A submitter has raised concern that the vibrations caused by the tunnelling of the M4-M5 Link would impact nuclear facilities.

Response

The project is not expected to result in vibration impacts on nuclear facilities. The nearest nuclear reactor is located at Lucas Heights, which is over 20 kilometres from the project. Vibration impacts from the project are discussed in **Chapter C10** (Noise and vibration). Nuclear medicine or research facilities which may be located at the Royal Prince Alfred Hospital are also not expected to be impacted by construction vibration. Vibration and ground-borne noise impacts would be managed in accordance with relevant guidelines and contractor procedures. See **section C10.9.5** and **Chapter E1** (Environmental management measures) for details of how vibration impacts would be managed during construction of the project.

C25.5 Hazard and risk environmental management measures

Five submitters raised concerns about the environmental management measures for hazard and risk impacts. See **Chapter E1** (Environmental management measures) of the EIS for further details on the hazard and risk environmental management measures.

C25.5.1 Hazard and risk environmental management measures

Submitters raised concerns regarding hazard and risk environmental management measures. Specific concerns included:

- The treatment of asbestos and breaches of asbestos management
- Calls for the requirement of contact details and protocols to be provided to local residents and businesses including Malt Shovel Brewery to advise on all potential safety incidents
- Requests for monitored hazard plans during construction for work site safety and removal of toxic materials (during demolition, excavation and construction)
- The need for adequate and independently monitored hazard plans during construction, especially work site safety and the quarantining and removal of toxic materials during demolition, excavation and construction.

Response

Several environmental management measures are proposed to manage hazards and risks from the project during construction and operation (see **Chapter E1** (Environmental management measures)). The relevant measures that would address the issues raised in submissions include:

- A hazardous materials assessment will be carried out prior to and during the demolition of buildings. Demolition works will be undertaken in accordance with the relevant Australian Standards and relevant NSW WorkCover Codes of Practice, including the Work Health and Safety Regulation 2011 (NSW) (see environmental management measure CM03)
- Asbestos handling and management will be undertaken in accordance with an Asbestos Management Plan and consistent with relevant codes of practice The plan will include prior notification to adjacent communities about potential hazards (see environmental management measure RW14)
- Potentially contaminated areas directly affected by the project will be investigated and managed in accordance with the requirements of guidance endorsed under section 105 of the *Contaminated Land Management Act 1997* (NSW). This includes further investigations in areas of potential contamination identified in the project footprint. If contamination posing a risk to human or ecological receptors is identified, a Remediation Action Plan will be prepared (see environmental management measure CM01)
- All potentially hazardous material will be identified and removed from buildings in an appropriate manner prior to the commencement of and/or progressively during demolition and in accordance with all relevant codes of practice (see environmental management measure AQ18)
- An Incident Response Plan will be developed as part of the Emergency Response Plan for the project and implemented in the event of an accident or incident (see environmental management measure OpHR4).

It is considered that these measures will adequately reduce the risk of impacts on safety of site workers and the local community.

Section 7.6.2 of the EIS discusses communication and consultation with stakeholders and the community during construction that will be undertaken by the design and construction contractor(s). This would focus on providing updates on construction activities and program, responding to enquiries and concerns in a timely manner and minimising potential impacts where possible.

During construction, a dedicated community relations team would deliver:

- A detailed Community Communication Strategy (identifying relevant stakeholders, procedures for distributing information and receiving/responding to feedback, and procedures for resolving stakeholder and community complaints during construction and operation)
- Notification letters and phone calls to residents and businesses directly affected by construction works, changes to traffic arrangements and out of hours works
- Face-to-face meetings with landowners as needed
- Regular community updates on the progress of the construction program
- Regular updates to the WestConnex website
- Media releases and project advertising in local and metropolitan English language and non-English language newspapers to provide contact information for the project team
- Site signage around construction ancillary facilities
- 24 hour, toll-free project information and complaints line, a dedicated email address and postal address.

A Complaints Management System will be in place for the duration of construction. This system will include the recording of complaints and how the complaint was addressed (within a Complaints Register). A Community Complaints Commissioner, who is an independent specialist, would oversee the system and would follow-up on any complaint where the public is not satisfied with the response.

C26 Cumulative impact assessment

This chapter addresses issues raised in community submissions associated with the cumulative impact assessment for the M4-M5 Link project. Cumulative impact issues raised associated with specific environmental issues are addressed in the relevant environmental chapters (**C8** to **C25**). Refer to Chapter 26 (Cumulative impacts) and Appendix C (Cumulative impact assessment methodology) of the Environmental Impact Statement (EIS) for the further detail on the cumulative impact assessment.

Contents

C26.1 Level and quality of the cumulative impact assessment approach

340 submitters raised concerns about the cumulative impact assessment. Refer to Chapter 26 (Cumulative impacts) and Appendix C (Cumulative impact assessment methodology) of the EIS for details of the approach to the cumulative impact assessment. The methodology for the cumulative impact assessment for the following EIS chapters: Chapter 8 (Traffic and transport), Chapter 9 (Air quality), Chapter 10 (Noise and vibration) and Chapter 11 (Human health risk), are discussed further within these chapters of the EIS and their respective technical working papers which were appended to the EIS.

C26.1.1 Cumulative impact assessment is not adequate

Submitters have raised concerns about the adequacy of the cumulative impact assessment presented in the EIS. Specific issues raised include:

- Objection to the methodology used for the cumulative impact assessment
- Concerns regarding the lack of assessment and analysis of the cumulative impacts of the M4 East and M4-M5 Link projects on the community of Haberfield and Ashfield
- The assessment does not specifically address cumulative impacts associated with :
  - Noise, dust, traffic, loss of heritage, commercial and residential property acquisitions and night works on residents during construction
  - Impacts to open spaces which will be in close proximity to unfiltered ventilation outlets and the project's road infrastructure
  - Construction and operation of the M4-M5 Link and preceding WestConnex projects
  - The impacts and experiences from the preceding WestConnex stages as they have been omitted
  - The Western Harbour Tunnel project, because it is a separate project to the Rozelle interchange
  - Construction and operation of past and current developments including those associated with improvements to the existing arterial roads and motorways.

Response

Cumulative impact assessment methodology

The methodology for the cumulative impact assessment for the construction and operational phases of the project was developed in consultation with NSW Department of Planning and Environment (DP&E). It has been undertaken in accordance with the Secretary's Environmental Assessment Requirements (SEARs) issued for the project, which required that the assessment generally address the following:

- The cumulative impacts of the project taking into account other WestConnex component projects, the proposed future Western Harbour Tunnel project, projects that have been approved but where construction has not commenced, projects that have commenced construction and projects that have recently been completed
- The cumulative impacts of concurrent project construction activities and proposed and approved projects (where information is available at the time the EIS was prepared).

The assessment included potential cumulative traffic and transport, air quality, noise, human health, urban design and visual amenity, social and economic, non-Aboriginal heritage, biodiversity, soil and water quality, flooding and drainage, groundwater and Aboriginal heritage impacts. The technical studies prepared for the EIS and Chapter 26 (Cumulative impacts) of the EIS provide a detailed cumulative impact assessment of the project with other WestConnex projects. The studies considered in some detail the interfaces between the M4-M5 Link and the M4 East at Haberfield/Ashfield and the New M5 at St Peters. This took into account potential impacts at these locations from the M4-M5 Link project and concurrent projects in the study area to ensure cumulative impacts could be avoided, managed and minimised.

Screening criteria to identify projects

The assessment methodology presented in Appendix C (Cumulative impact assessment methodology) of the EIS outlines the screening criteria applied in determining whether projects have the potential to result in cumulative impacts and a justification for projects considered but not included in the assessment.

Cumulative impacts have been assessed and considered in two categories; impacts related to the overall WestConnex program of works and impacts from other related infrastructure projects or projects in the vicinity of the M4-M5 Link project footprint. The identification of other projects that could occur in the vicinity of the M4-M5 Link included relevant projects listed on the NSW Major Projects website as State significant development or State significant infrastructure and known or proposed projects of a relevant scale or impact that involve activities that could result in a cumulative impact with the M4-M5 Link project.

Following the application of the screening criteria to identify relevant projects, the projects included in **Table C26-1** (adapted from section 26.2 of the EIS) were considered in the assessment of cumulative impacts for the project. The status of each of these projects and the available public information at the time of the EIS was used in the cumulative impact assessment. Since then, some of these projects have progressed further. **Table C26-1** provides a description of the current status of these projects, based on publicly available information.

Table C26-1 Projects included in the cumulative impact assessment

Project	Description of current project status
WestConnex projects	
King Georges Road Interchange Upgrade (KGRIU)	Open to traffic
M4 Widening	Open to traffic
M4 East	Under construction. The project is expected to be completed and open to traffic in 2019.
New M5	Under construction. The project is expected to be completed and open to traffic in 2020.
Other projects	
Sydney Gateway	Undergoing concept design development and subject to separate environmental assessment and approval. For the purposes of the cumulative impact assessment presented in the EIS, the Sydney Gateway project was conservatively assumed to be operational by 2023. No further information is available on the NSW Roads and Maritime Services (Roads and Maritime) website[1].

[1] http://www.rms.nsw.gov.au/projects/sydney-south/sydney-gateway/index.html

Project	Description of current project status
Western Harbour Tunnel and Beaches Link program of works	Both projects in the program are undergoing concept design development and are subject to separate environmental assessment and approval. For the purposes of the cumulative impact assessment presented in the EIS, the Western Harbour Tunnel project was conservatively assumed to be operational by 2023, noting that construction may continue after the expected opening year of the M4-M5 Link project. For the purposes of the cumulative impact assessment, the Beaches Link project was conservatively assumed to be operational by 2033. Further information on these projects has been made public since the cumulative impact assessment for the M4-M5 Link EIS was undertaken. A concept design for the Western Harbour Tunnel project has been prepared and work is underway on preparing the reference design and EIS. SEARs for both projects have been issued and are available on the NSW Major Projects website[2]. The timing for the construction and operation of these projects is still not known.
F6 Extension	Future strategic project, subject to separate environmental assessment and approval. For the purposes of the cumulative impact assessment presented in the EIS, the F6 Extension was conservatively assumed to be operational by 2033. Since the cumulative impact assessment for the M4-M5 Link EIS was undertaken, Roads and Maritime has lodged a Scoping Report for Stage 1 (linking the New M5 at Arncliffe with President Avenue at Kogarah) with the NSW Department of Planning and Environment's (DP&E), which is available on the Major Projects website. No further information is available on the timing of the project.
Rozelle Rail Yards Site Management Works	Works commenced in mid-2017 and are expected to take up to 12 months to complete. This information remains current.
Sydney Metro City and Southwest	Stage 1 (Chatswood to Sydenham) was approved in January 2017. Stage 2 (Sydenham to Bankstown) was under environmental assessment at the time of the M4-M5 Link EIS. The EIS for Stage 2 has since been placed on public exhibition. The main project feature relevant to the cumulative impact assessment is the southern dive structure (about 400 metres in length) and tunnel portal north of Sydenham Station and south of Bedwin Road at Marrickville (called the Marrickville dive site) for Stage 1. Additional information on the Marrickville dive site is provided in the Sydenham Station Modification Report, available on the NSW Major Projects website.
Central business district (CBD) and South East Light Rail – Rozelle Maintenance Depot (also referred to as the Lilyfield Depot)	The maintenance depot is under construction. The construction of the maintenance depot is expected to be complete by early 2018. The CBD and South East Light Rail (CSELR) project includes a light rail vehicle stabling facility at Randwick and a maintenance depot at Rozelle, at the western end of the Rozelle Rail Yards site. The maintenance depot is still under construction.

[2] http://majorprojects.planning.nsw.gov.au/

Project	Description of current project status
Parramatta Road Corridor Urban Transformation Strategy	Future strategic project. While the final strategy was published with a high level implementation plan for 2016-2023 (UrbanGrowth NSW 2016a), details of specific works along Parramatta Road are not yet known. The strategy identifies the 'Camperdown Triangle' at the intersection of Parramatta Road, Pyrmont Bridge Road and Mallett Street as a potential biomedical hub. The strategy identifies a public transport 'super stop' at the intersection of Pyrmont Bridge Road and Parramatta Road.
The Bays Precinct Transformation Plan	Future strategic project. Preliminary investigation and consultation is underway for the development of the White Bay Power Station site, the most relevant 'destination' to the M4-M5 Link. Specific details and timing of the redevelopment are not known.
Whites Creek naturalisation	A concept design was prepared in December 2016. The specific design details and construction timelines for these works are still not known.

Cumulative impact assessment scenarios

Development projects and infrastructure that already exists was used to develop the baseline year (2015) of assessment in the traffic modelling. The baseline year scenario supported the future year predictions for cumulative impacts. Cumulative impacts during the operation of the project are based on the findings of the operational traffic and transport assessment and how this in turn affects changes in air quality within the broader airshed, changes in noise levels, subsequent human health risks and impacts on the social and economic environment. The traffic assessment included modelling of cumulative operational traffic scenarios at 2023 (year of opening) and 2033 (ten years after opening).

The two operational scenarios used for the assessment of cumulative operational impacts were:

- At the year of opening of the M4-M5 Link (2023) with operation of NorthConnex, M4 Widening, M4 East, King Georges Road Interchange Upgrade and New M5, and the proposed future Sydney Gateway and Western Harbour Tunnel (a component of the proposed future Western Harbour Tunnel and Beaches Link program of works)
- Ten years after opening of the M4-M5 Link (2033), with operation of NorthConnex, M4 Widening, M4 East, King Georges Road Interchange Upgrade and New M5 and the proposed future Sydney Gateway, Western Harbour Tunnel, Beaches Link and the F6 Extension.

The modelling forecast traffic from the operation of the approved WestConnex projects and the M4-M5 Link as well as a number of proposed motorway projects (see **Table C26-2**). The traffic modelling was based on land use and employment forecasts for metropolitan Sydney including forecasts for proposed growth precincts and urban developments such as the Parramatta Road corridor, The Bays Precinct, Central to Eveleigh corridor, Green Square and Mascot town centre. The modelling also included a range of approved and proposed major road and public transport projects including the CBD and Southeast Light Rail and Sydney Metro City and Southwest projects. It also included forecast growth in the Sydney Airport and Port Botany precinct and the proposed Western Sydney Airport at Badgerys Creek.

While the projects in **Table C26-2** were included in the traffic modelling, some of these projects are still in early stages of design development, do not have a finalised business case and an EIS has not yet been prepared (this includes Sydney Gateway, F6 Extension, Western Harbour Tunnel and Beaches Link). As a result there is limited information available about project design, construction methodology and timeframes for these projects. Reasonable assumptions were therefore adopted for the M4-M5 Link cumulative traffic assessment. Further cumulative impact assessment would occur as part of the environmental assessment processes for these proposed future projects.

Table C26-2 Cumulative operational scenarios as defined for the traffic, air quality, noise and vibration and human health assessments

Scenario description			Projects included										
Traffic/ Air quality	Noise and vibration	Human health risk	Existing road network	WestConnex M4 Widening	WestConnex M4 East	WestConnex KGRIU	WestConnex New M5	WestConnex M4-M5 Link	NorthConnex	Sydney Gateway	Western Harbour Tunnel[1]	Beaches Link[1]	F6 Extension
Do minimum	No build	Without project	✓	✓	✓	✓	✓		✓				
2023 – Do something (DS)	2023 Build Do-something	2023 With project	✓	✓	✓	✓	✓	✓	✓				
2023 – Do something cumulative (DSC)	2023 Build Do-something plus	2033 With project cumulative	✓	✓	✓	✓	✓	✓	✓	✓	✓		
2033 – Do something	2033 Build Do-something	2033 With project	✓	✓	✓	✓	✓	✓	✓				
2033 – Do something cumulative	2033 Build Do-something plus	2033 With project cumulative	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes:
1 A component of the proposed future Western Harbour Tunnel and Beaches Link program of works.

Longer term cumulative construction impacts assessment

An assessment of longer term construction impacts considered an extended loss of amenity as a consequence of concurrent or consecutive activities occurring over extended periods. Impacts from longer term construction impacts typically relates to traffic and access disruptions, noise and vibration, air quality, visual amenity and social and economic impacts from projects that have overlapping construction phases or are carried out back-to-back. The cumulative impact assessment identified three specific geographic areas where longer term construction impacts from concurrent or consecutive activities with other WestConnex component projects and other relevant projects was likely to be experienced, being:

- Haberfield/Ashfield (M4 East)
- Rozelle (Rozelle Rail Yards site management works and CSELR maintenance depot)
- St Peters (New M5 and Sydney Metro City and Southwest).

Potential longer duration construction impacts in these areas are assessed in section 26.3.1 of the EIS. Additional responses to submissions on longer duration construction impacts are included in **section C14.12**. Measures to effectively manage longer duration construction impacts affecting the community are provided in **section C14.13** and **Chapter E1** (Environmental management measures).

Lessons learned from other WestConnex projects

Feedback gained from stakeholders and the community on other projects and relevant lessons learnt from design and construction contractor(s) and utility companies were considered in the assessment of potential cumulative impacts (refer to Chapter 7 (Consultation) of the EIS).

C26.1.2 Other projects not included in the cumulative impact assessment

Submitters expressed concern that the cumulative impact assessment had not considered the following developments and projects:

- Sydney Metro West (which would have a significant impact on travel behaviour, including mode share)
- King Street Gateway
- Alexandria to Moore Park Connectivity Upgrade
- Parramatta Road pinch point project
- Parramatta Road Bus Rapid Transit
- Parramatta Light Rail
- Johnstons Creek naturalisation
- Inner West Greenway
- Various active transport projects currently under development such as the City West Bicycle Links and Inner West Regional Bike Network
- Iron Cove Creek naturalisation project.

Response

The cumulative impact assessment methodology (refer to section 1.1.2 of Appendix C (Cumulative impact assessment methodology) of the EIS), outlines clear rationale for the screening criteria applied in determining whether projects should be assessed for cumulative impacts. The screening criteria included the following:

- **Spatial relevance:** A project was considered to be spatially relevant where that project overlapped or was adjacent or proximal to the M4-M5 Link project footprint
  - A project was considered to be adjacent to the M4-M5 Link project where it was within 500 metres of the M4-M5 Link project footprint
  - A project was considered to be proximal to the M4-M5 Link project where it was within two kilometres of construction sites or within 10 kilometres of the M4-M5 Link project footprint

- **Temporal relevance:** A project was considered to be temporally relevant where the expected timing of the construction or operation of a project would be concurrent (ie overlap) with the timing of the construction or operation of the M4-M5 Link project
- **Publicly available information:** Projects under consideration must have publicly-available information (at the time of preparing this EIS), with an adequate level of detail. If a potential future project was known to the EIS team, but there was insufficient public data available to allow a qualitative assessment of the potential cumulative impacts, it was not able to be included in the cumulative impact assessment.

All of the above criteria were applied in determining whether a project would be included in the cumulative impact assessment presented in the EIS. **Table C26-3** summarises the projects considered for the cumulative assessment and the justification for why they were not included (refer to section 1.2 of Appendix C (Cumulative impact assessment methodology) of the EIS). This table lists all the projects summarised in the EIS as well as those identified in submissions which were not outlined in the EIS. The status of these projects and the information available was accurate at the time of the assessment for the EIS.

Table C26-3 Projects considered but not assessed in the cumulative impact assessment

Project name	Potential interaction with the M4-M5 Link	Justification for exclusion
King Street Gateway	Overlaps with the M4-M5 Link mainline tunnel footprint. Potential construction time period overlap with the M4-M5 Link project (however the program is unknown at this stage). Traffic implications on the road network around the M4-M5 Link.	• Design of the project in early stages • Insufficient public information was available • Impacts and the timing of the project were not known at the time of the EIS assessment.
Alexandria to Moore Park Connectivity Upgrade	The project footprint at the Euston Road intersection with Maddox Street is in proximity (less than one kilometre) to the M4-M5 Link footprint at the St Peters interchange and directly connects to the WestConnex New M5 project at this intersection.	• Design of the project in early stages • Insufficient public information was available • Impacts and the timing of the project were not known at the time of the EIS assessment • Roads and Maritime is preparing a separate Review of Environmental Factors to assess the potential impacts of this project.
Parramatta Road Bus Rapid Transit	The M4-M5 Link would provide reductions in traffic along sections of Parramatta road thereby enabling public transport improvements on this corridor. One of the proposed bus rapid superstops is planned for Parramatta Road at the intersection with Pyrmont Bridge Road, which is adjacent to the M4-M5 Link Pyrmont Bridge Road tunnel site. Changes to traffic conditions as a result of a new rapid transit system would also potentially impact on communities impacted by the M4-M5 Link project. There is a potential for construction periods to overlap.	• Design of the project in early stages • Insufficient public information was available • Impacts and the timing of the project were not known at the time of the EIS assessment.

Project name	Potential interaction with the M4-M5 Link	Justification for exclusion
Parramatta Light Rail	There is a potential for construction periods to overlap. Spatial overlap is unlikely as the proposed corridor location of Parramatta Light Rail Stage 1 and Stage 2 is some distance to the west of the M4-M5 Link project. Changes to traffic conditions as a result of a new light rail system are anticipated to be minor as the route is localised around Parramatta and surrounding areas.	• Design of the project in early stages • Insufficient public information was available • Project footprint unlikely to overlap • Impacts and the timing of the project were not known at the time of the EIS assessment.
Sydney Metro West	The project is in spatial proximity to the M4-M5 Link around The Bays Precinct.	• Design of the project in early stages • Insufficient public information was available • Impacts and the timing of the project were not known at the time of the EIS assessment.
Inner West Greenway	Spatial overlap above the M4-M5 Link mainline tunnel alignment at Haberfield and Leichhardt near Hawthorne Canal and also adjacent to the Darley Road civil and tunnel site. Potential for construction of the missing links in and around the project footprint to occur at the same time as construction for the M4-M5 Link.	• Design of the missing links of the project in early stages • Insufficient public information was available • Impacts and the timing of the missing links of the project were not known at the time of the EIS assessment.
The Green Grid	It is possible that the Green Grid project may spatially overlap with some parts of the M4-M5 Link footprint. The 'central region' of the Green Grid includes the area at Alexandria Canal, which is close to the St Peters interchange.	• Design of the project in early stages • Insufficient public information was available • Impacts and the timing of the project were not known at the time of the EIS assessment.
Johnstons Creek naturalisation	The naturalisation project does not interact directly with the M4-M5 Link project footprint but at its closest point is within 500 metres of the project footprint at the intersection of The Crescent and City West Link.	• Design of the project in early stages • Insufficient public information was available • Impacts and the timing of the project were not known at the time of the EIS assessment • There is no direct overlap with the project footprint for the M4-M5 Link.
Lilyfield Road Regional Bike Route Separated Cycleway	Spatial overlap along Lilyfield Road and Victoria Road near the Rozelle Rail Yards.	• Design of the project in early stages • Insufficient public information was available • Impacts and the timing of the project were not known at the time of the EIS assessment.

Project name	Potential interaction with the M4-M5 Link	Justification for exclusion
Superyacht Marina	Proximal to the Rozelle Rail Yards.	• Design of the project in early stages • Insufficient public information was available • Impacts and the timing of the project were not known at the time of the EIS assessment.
CBD Metro	Spatial overlap at Rozelle where a new station and stabling facility were proposed. The station would be located beneath Victoria Road, near the corner of Darling Road and in proximity to the proposed Iron Cove Link.	• Temporal relevance not determined • Although the design has considered the protected corridor, there is currently no government commitment to proceed.
Cooks Cove precinct redevelopment – Stage 1: Southern Precinct	The Cooks Cove Southern Precinct is located around three kilometres from the St Peters interchange.	• Design of the project in early stages • Insufficient public information was available • Impacts and the timing of the project were not known at the time of the EIS assessment.
Easing Sydney's Congestion Pinch Point Program	Pinch points projects are generally small upgrades of specific intersections or short lengths of road. The current project program runs from 2012 for five years. Two projects on Parramatta Road have already been completed. One project, Parramatta Road and Great North Road, remains and is adjacent to the M4-M5 Link project area. In 2015 a new 10 year program of corridor studies were proposed by the NSW Government. This includes a study of Parramatta Road: Strathfield to Leichhardt and public transport improvements to Victoria Road. No specific projects have been identified however.	• Corridor analysis in early stages • No future projects for Parramatta Road have been identified.
Iron Cove Creek naturalisation program	The naturalisation of a section of Iron Cove Creek (also known as Dobroyd Canal) is currently being investigated by Sydney Water. The section of the creek being investigated runs from Ramsay Street to Dobroyd Canal at Five Dock, and is about 90 metres north of the of the Wattle Street tunnel portals works (by M4 East) and Wattle Street entry and exit ramp works (by M4-M5 Link).	• Design of the naturalisation of Iron Cove Creek was still in the early stages • Impacts and timing of the project were not known at the time of the EIS assessment • There is no direct overlap with the project footprint for the M4-M5 Link.

Project name	Potential interaction with the M4-M5 Link	Justification for exclusion
City West Bicycle Links (CWCL)	The CWCL would extend the Greenway from North Leichhardt along the light rail corridor to Anzac Bridge. The corridor would provide a continuous connection to the Sydney CBD that is completely separated from motor vehicles. The western end of the CWCL would link to the Greenway corridor and the Cooks River cycle path as well as to major routes through the Bay Run. The eastern end of the CWCL would connect to the Sydney CBD along Anzac Bridge and to major northern routes along Victoria Road.	• The design of this project was still in early stages, as a concept, at the time of the EIS assessment.
Inner West Regional Bike Network	The Inner Sydney Regional Bicycle Network included an investigation into a broad network of routes across inner Sydney suburbs including various through the project footprint.	• Design of the bike network was still in early stages • Timing of construction works located in and around the project footprint was not available at the time of the EIS assessment.

C26.2 Cumulative impact of multiple environmental issues during the M4-M5 Link project

Six submitters raised concerns about the cumulative impact of multiple environmental issues during the M4-M5 Link project. Refer to Chapter 26 (Cumulative impacts) and Appendix C (Cumulative impact assessment methodology) of the EIS for details regarding cumulative environmental impacts.

C26.2.1 Multiple environmental impacts during both construction and operation

Submitters have raised concern regarding multiple environmental impacts of the project occurring at the same time during both construction and operation of the M4-M5 Link. Specific issues raised include:

- Concern no attempts were made to consider the cumulative impacts of all the separate negative risks of the project and how they would impact on the overall resilience and health of inner west communities
- Concern regarding the cumulative impact of increased traffic and subsequent air pollution, demolition and safety concerns. These concerns are specifically raised for the residential areas of Leichhardt and Haberfield
- Concern with the cumulative impacts of project construction and utilities works around Darley Road.

Response

The EIS assesses the environmental, health and social impacts which may affect individual receivers and neighbourhoods. Each technical chapter of the EIS (Chapters 8 to 25) assessed the potential impacts which may occur from the construction or operation of the M4-M5 Link while Chapter 26 (Cumulative impacts) of the EIS comprises a detailed cumulative impact assessment. These include consideration of consecutive and concurrent (cumulative) impacts relating to increased traffic (refer to Chapter 8 (Traffic and transport)), air quality (refer to Chapter 9 (Air quality)), noise (refer to Chapter 10 (Noise and vibration)), human health (refer to Chapter 11 (Human health risk)) and public safety issues resulting from demolition (refer to Chapter 25 (Hazard and risk)) of the EIS.

The outcomes of the EIS technical assessments were used to inform the development of management and mitigation measures (see **Chapter E1** (Environmental management measures)) and the collective implementation of these measures would minimise a combination of impacts at each receiver. Construction impacts would be minimised where feasible and reasonable during detailed design and construction planning through the development of appropriate management and mitigation measures and consultation with affected residents and stakeholders. The construction strategy for the project (and the broader WestConnex program of works) focuses on balancing the need for construction to occur in a safe and efficient manner while managing constructability constraints and minimising cumulative impacts on the community, environment, road users and the surrounding road network.

Roads and Maritime acknowledge that the impacts from construction of the WestConnex program of works at Haberfield/Ashfield and St Peters are not short term, as the consecutive construction of components of the WestConnex projects would extend the duration of impacts to a period of up to seven years for some receivers in these areas. The range and intensity of impacts have and would continue to vary during these periods as construction progresses, with the majority of impacts occurring or expected to occur as a result of certain construction activities and during certain times of the day (for example outside standard daytime construction hours).

Key impacts resulting from longer duration construction in these areas may include noise and vibration, construction traffic, dust, visual impacts and impacts on parking on local streets around construction sites. Construction activities most likely to result in longer duration impacts include surface road works, utility works, tunnelling and tunnelling support (such as spoil handling and transport). Refer to **section B2.2.1** for further information regarding ongoing construction impacts at Haberfield and St Peters, including a list of strategies to further manage the impacts associated with longer duration construction impacts from the concurrent and consecutive construction of the WestConnex component projects in these areas.

For the Darley Road civil and tunnel site (C4), utility works including protection and/or adjustment of existing utilities, removal of redundant utilities and installation of new utilities are scheduled to begin in 2018 and be completed in early 2019. Potential impacts to local communities from utility works around Darley Road were considered within the construction assessments in the traffic, noise and air quality chapters of the EIS and within Appendix F (Utilities Management Strategy) of the EIS. Potential cumulative impacts between the M4-M5 Link and utility works by service providers will be managed in accordance with the Utilities Management Strategy.

Operational cumulative impacts are captured in the operational traffic modelling informing the cumulative operational assessments for traffic, air quality, noise and human health risk. The project has therefore included design measures to minimise cumulative operational impacts with other interfacing projects including the M4 East and the New M5 projects. For projects still in early design development such as Sydney Gateway and the Western Harbour Tunnel and Beaches Link, there will be a requirement to assess cumulative impacts as part of the environmental assessment processes for these projects. Environmental management measures such as a review of operational network performance would be implemented to ensure that cumulative operational traffic impacts are identified and considered in future operational network performance planning (see **Chapter E1** (Environmental management measures) for a full list of the projects traffic environmental management measures).

C26.3 Cumulative impacts with other projects

81 submitters raised concerns about the cumulative impacts of the M4-M5 Link and other projects across multiple environmental issues. Refer to section 26.4 of the EIS for details of cumulative impacts with other projects.

C26.3.1 Cumulative impacts with other projects

Concerns have been raised relating to the cumulative impacts arising from a combination of the construction and operation of the project with other projects. The following specific concerns have been raised:

- Cumulative impacts of road expansion and associated sprawl
- Construction overlap with the Western Harbour Tunnel and Beaches Link projects. Specifically, a submitter requested further information on how M4-M5 Link would be managed alongside the proposed Western Harbour Tunnel project, so that the community is not subject to nearly a decade of work. Questions asked included:

  - Is this work going to happen simultaneously?
  - How have the adverse impacts of these two projects happening together been assessed and how will these impacts be mitigated?

- Impacts from tunnelling for the M4-M5 Link and Sydney Metro City and Southwest on the communities of Tempe, Sydenham, St Peters, Newtown and Camperdown
- Public transport efficiency will be impacted by the compounded effect of Sydney Metro reducing train services during construction and New M5 and M4-M5 Link on bus services around St Peters interchange.

Response

The cumulative impact assessment considered potential cumulative impacts from the construction and operation of the project and other projects such as the proposed future Western Harbour Tunnel and Beaches Link and Sydney Metro City and Southwest (refer to section 26.4 of the EIS). This included an assessment of consideration of consecutive and concurrent (cumulative) traffic and transport (refer to Chapter 8 (Traffic and transport)), air quality (refer to Chapter 9 (Air quality)), noise (refer to Chapter 10 (Noise and vibration)), human health (refer to Chapter 11 (Human health)), urban design and visual amenity (refer to Chapter 13 (Urban design and visual amenity)), social and economic (refer to Chapter 14 (Social and economic)), soil and water quality (refer to Chapter 15 (Soil and water quality)), flooding and drainage (refer to Chapter 17 (Flooding and drainage)), biodiversity (refer to Chapter 18 (Biodiversity)), groundwater (refer to Chapter 19 (Groundwater)), non-Aboriginal heritage (refer to Chapter 20 (Non-Aboriginal heritage)), Aboriginal heritage impacts (refer to Chapter 21 (Aboriginal heritage)) and cumulative impacts (refer Chapter 26 (Cumulative impacts)).

The strategic traffic modelling for the project included land use and employment forecasts for the Sydney metropolitan area including areas with proposed growth precincts such as the Parramatta Road corridor, Bays Precinct, Central to Eveleigh corridor, Green Square and Mascot town centre. The modelling also included a range of proposed major road and public transport projects including CSELR and Sydney Metro City and Southwest (refer to section 26.3.2 of the EIS).

Future population and employment growth and associated land use development across Sydney, including upgrades of transport infrastructure and roads, are considered cumulatively by the NSW Government through policy development and the preparation of integrated land use and transport strategies. This is discussed further in **section C3.1.2**.

Western Harbour Tunnel and Beaches Link program of works

Details regarding construction of the Western Harbour Tunnel are not available at this time as the project is in the early stages of design development. For the purpose of the EIS, it was assumed that the construction of the proposed future Western Harbour Tunnel would indicatively occur from 2019 to 2025 and as such would overlap with the M4-M5 Link construction. The likely trip generation for heavy and light vehicles travelling west from the Western Harbour Tunnel construction site, assumed to be travelling a similar route to M4-M5 Link traffic, was added to the cumulative construction traffic assessment presented in this EIS.

Analysis indicated that the impact from additional Western Harbour Tunnel construction traffic on the road network would be minimal, with most intersections operating at the same level of service as modelled for the M4-M5 Link. A few intersections along Wattle Street and Parramatta Road are forecast to experience a slight worsening in level of service during the AM and PM peak periods as a result of Western Harbour Tunnel construction traffic, namely:

- Parramatta Road/Wattle Street intersection in the AM peak hour
- Parramatta Road/Harris Road and Parramatta Road/Croydon Road/Arlington Street intersections in the AM peak hour
- Wattle Street/Ramsay Street in the PM peak hour (refer to section 7.6 of Appendix H (Technical working paper: Traffic and transport) of the EIS).

These cumulative impacts on the road network would not be experienced for the full duration of the consecutive construction period of the M4-M5 Link and the Western Harbour Tunnel and Beaches Link project and would be subject to further assessment in the Western Harbour Tunnel EIS.

On-road public transport in the cumulative construction scenario would generally experience levels of service as they do under the M4-M5 Link project construction scenario with a small reduction in levels of service in some locations due to the increased demand generated by the Western Harbour Tunnel construction traffic.

Air quality impacts, principally relating to dust from construction activities, would be manageable through well established and effective management and mitigation measures. Therefore cumulative air quality impacts from construction ancillary facilities are not expected to be significant.

The potential impacts on pedestrians and cyclists along Lilyfield Road adjacent to the Rozelle civil and tunnel site, potentially in the form of additional light vehicle movements along Lilyfield Road during construction, would likely be lengthened due to the construction of the proposed future Western Harbour Tunnel and Beaches Link project.

The construction of the project will not result in a significant increase in construction vehicle numbers on the road network compared to existing traffic levels. Construction traffic to and from construction ancillary facilities represents a very small increase in traffic compared to background traffic volumes therefore the magnitude of potential impacts is minor.

Given that several tunnelling works activities may operate simultaneously at Rozelle associated with the M4-M5 Link and the proposed future Western Harbour Tunnel, cumulative construction noise impacts may be apparent during out-of-hours works periods where cumulative impacts are predicted to result in noise management level exceedances of up to 20 dB(A) at times during the night-time period. Receivers most likely to be affected by these construction impacts include those adjoining Lilyfield Road between Justin Street and Ryan Street and adjoining Brenan Street between Starling Street and White Street.

The Western Harbour Tunnel project has potential to have cumulative groundwater impacts with the M4-M5 Link project in the Rozelle area. At the time the EIS was drafted, only limited information was available about the proposed design and construction methodology for the Western Harbour Tunnel project and as a result no meaningful analysis of impacts was possible. Cumulative groundwater impacts would be addressed in the future as part of the EIS for the Western Harbour Tunnel project.

It is assumed that the construction of the Western Harbour Tunnel surface works at the Rozelle Rail Yards would occur concurrently with the M4-M5 Link and consecutively beyond 2023. This would result in the proposed open space area at Rozelle Rail Yards being delivered in stages – the first stage in late 2023 after completion of the M4-M5 Link project and the next stage some time post 2023 after completion of the Western Harbour Tunnel construction. This would also extend the visual impacts associated with construction for a longer duration at Rozelle.

Positive cumulative impacts to local businesses and the economy would likely result from the concurrent construction activity associated of the M4-M5 Link and the Western Harbour Tunnel and Beaches Link project, which is likely to intensify employment and economic stimulus impacts. There is potential for wages to increase due to high demand for construction workers and opportunities for local businesses to supply goods or services for construction of these projects and to project personnel. Business turnover is also likely to increase due to demand.

Potential negative impacts to business and the economy are assessed in detail in section 7.9 of Appendix P (Technical working paper: Social and economic) of the EIS. These impacts include changes to access and visibility (passing trade) as well as amenity impacts such as increased noise and vibration, changes to the visual landscape and impacts on traffic and parking. Roads and Maritime acknowledge that the impacts from construction of the two projects at Rozelle are not short term and would extend the duration of impacts to a period of up to seven years for some receivers in this area.

Sydney Metro City and Southwest project

Elements of the M4-M5 Link construction program would likely also overlap with the construction of the Sydney Metro City and Southwest project (Stage 1: Chatswood to Sydenham). Construction traffic from the Sydney Metro Stage 1 Marrickville dive site, which is around one kilometre to the northwest of Campbell Road civil and tunnel site (C10), may use the Princes Highway, which would also be used by traffic from the M4-M5 Link construction site at Campbell Road at St Peters.

The Sydney Metro City and Southwest rail tunnels are to be constructed as undrained (tanked) tunnels that would cross the M4-M5 Link project alignment in the vicinity of Lord Street at Newtown. As the twin Sydney Metro tunnels are to be constructed as tanked tunnels, there will be negligible cumulative impacts on groundwater drawdown. The station boxes are to be constructed and operated as drained shafts and will extract groundwater from the local hydrogeological regime over time. The closest drained structure is proposed at Marrickville Station which is some distance to the west of the M4-M5 Link, and as such is considered unlikely to have significant cumulative impacts on groundwater drawdown.

The Sydney Metro tunnels are likely to be constructed prior to the M4-M5 Link tunnels although it is unlikely they would be operational by the time the M4-M5 Link tunnel excavation was complete. Therefore it is anticipated that there would be no cumulative ground borne noise impacts. The Sydney Metro tunnels are likely to be subject to settlement as a result of the M4-M5 Link. The magnitude of settlement, however, is unlikely to adversely impact the integrity of the Sydney Metro tunnels (refer to section 12.3.4 of the EIS).

Elements of the M4-M5 Link construction program would also occur concurrently with the construction of the Sydney Metro City and Southwest project (Stage 1: Chatswood to Sydenham). Construction traffic from the Sydney Metro Marrickville dive site, which is some distance to the west, may use the Princes Highway, which would also be used by traffic from the M4-M5 Link at Campbell Road construction ancillary facility (C10) at St Peters (refer to section 26.4.1 of the EIS).

C26.4 Management of cumulative issues

144 submitters have raised concerns regarding the management of cumulative construction impacts from several overlapping construction projects. See **Chapter E1** (Environmental management measures) for details of cumulative environmental management measures.

C26.4.1 Adequacy of management of cumulative impacts

Submitters raised concerns that not enough is being done to manage and minimise cumulative impacts. Specific issues raised include:

- The mitigation strategies, for the multiple cumulative impacts, are generic and not strong enough. This requires significant further development, before any approvals should be given
- Mitigation measures are lacking to ease the cumulative construction impacts of several tunnelling projects operating simultaneously in Camperdown
- The lack of appropriate management measures to address the cumulative impacts relating to utility works, due to poor coordination.

Response

The mitigation strategies proposed to manage and minimise cumulative impacts assumes that site specific mitigation measures for each study discipline presented in the EIS would already be in place (see **Chapter E1** (Environmental management measures)). The project will maintain regular communication with other projects that have the potential to result in cumulative impacts with the M4-M5 Link, including the projects listed in Table 26-2 of the EIS and other projects that are approved during construction of the project and have the potential to result in cumulative impacts, as determined using the screening criteria described in section 1.1.2 of Appendix C (Cumulative impact assessment methodology) of the EIS. Information will be requested from each project regarding upcoming works scheduled in the vicinity of the M4-M5 Link to facilitate coordination of project works to manage potential cumulative impacts where feasible (refer to environmental management measure C1 in **Chapter E1** (Environmental management measures). A Community Consultative Committee will be established for the project (refer to environmental management measure C2 in **Chapter E1** (Environmental management measures). The committee will provide a forum for discussion between Roads and Maritime, the design and construction contractor(s), local community and councils regarding the project, including cumulative impacts.

Construction impacts would be minimised where feasible and reasonable during detailed design and construction planning through, application of appropriate management and mitigation measures, and consultation with affected residents and stakeholders. The construction strategy for the project focuses on balancing the need for construction to occur in a safe and efficient manner while managing constructability constraints and minimising cumulative impacts on the community, environment, road users and the surrounding road network.

A Utilities Management Strategy was developed for the EIS (refer to Appendix F (Utilities Management Strategy) of the EIS). Section 9 of this strategy outlines the coordination and consultation process for proposed utility works between the design and construction contractor(s) and utility service providers. Environmental management measures to manage potential impacts are discussed in **section C12.9.1** and **section C12.11.2** and include the establishment of a Utility Co-ordination Committee. The implementation of the Utilities Management Strategy is an environmental management measure for the project (see environmental management measure PL14 in **Chapter E1** (Environmental management measures)).

To minimise the impacts associated with longer duration construction impacts from the concurrent construction of the WestConnex component projects in these areas and to respond to issues raised during the construction of other WestConnex projects and in submissions on the M4-M5 Link EIS, the following strategies are proposed:

- Provision of additional off-street car parking for the construction workforce, with the use of the White Bay civil site (C11) which would provide around 50 parking spaces. This site is further described in **Chapter D2** (White Bay civil site (C11))
- Using the Northcote Street civil site (C3a) at Haberfield as a construction workforce car park and laydown area. Currently this site is used as the main tunnelling site for the eastern end of the M4 East project
- Reducing the surface construction footprint of the Wattle Street civil and tunnel site (C1a) to limit surface construction activities to the Wattle Street entry and exit ramps. Compared to the indicative layout presented in Chapter 6 (Construction work) of the EIS for this site, this would reduce potential construction impacts such as noise and vibration and dust during construction of the M4-M5 Link project and would also allow for realisation of the M4 East urban design and landscaping outcome for this area at the completion of the M4 East project
- Provision of a heavy vehicle truck marshalling facility at the White Bay civil site (C11), which would cater for around 40 heavy vehicles and stage the release of trucks to the tunnelling sites to manage the arrival of trucks to construction ancillary facilities (see **Part D** (Preferred infrastructure report)). Provision of a truck marshalling facility and additional construction workforce parking would result in several benefits for the community and the project, including:
  - Reducing potential queuing, idling, circling and congestion on local roads surrounding the project and associated construction ancillary facilities
  - Providing additional construction workforce parking spaces, which would minimise construction workers parking on local roads
  - Minimising disruptions to the road network around construction ancillary facilities and noise and other disturbance to the local community including residential, business and commercial properties
  - Improving safety for construction workers, motorists and the general public by providing a controlled area from which project traffic schedulers can manage trucks and direct truck drivers to the construction sites at an appropriate time
- Development of a car parking strategy that will quantify construction workforce parking demand, identify public transport options (and measures such as carpooling and shuttle-buses) and identify all locations that will be used for construction workforce parking (see environmental management measure TT04 in **Chapter E1** (Environmental management measures))
- Development and implementation of a truck management strategy that will identify potential truck marshalling areas that will be used for the project and describe management measures for project-related heavy vehicles to avoid queuing and site-circling in adjacent streets and other potential traffic and access disruptions (see environmental management measure TT16 in **Chapter E1** (Environmental management measures))

- Designing acoustic sheds with consideration of the activities that will occur within them and the relevant noise management levels in adjacent areas. Monitoring will be carried out to confirm that the actual acoustic performance of each shed is consistent with predicted acoustic performance (see environmental management measure NV7 in **Chapter E1** (Environmental management measures))
- The appointment of a suitably qualified and experienced Acoustics Advisor, who is independent of the design and construction contractor, and who will be engaged for the duration of construction of the project (see environmental management measure NV1 in **Chapter E1** (Environmental management measures))
- Use of the M4 East and New M5 tunnels for spoil haulage when they become available and where practicable, to minimise heavy vehicle movements on the surface road network
- Consideration of receivers that qualify for assessment for at-receiver treatment due to predicted operational road traffic noise, that are also predicted to experience exceedances of noise management levels during construction, for at-receiver treatments as a priority (see environmental management measure NV9 in **Chapter E1** (Environmental management measures)).

Specific management and mitigation will be documented in relevant construction environmental management sub-plans, the Ancillary Facilities Management Plan and the Construction Traffic and Access Management Plan. This will include detailed consideration of the types of activities that would be most likely to cause longer duration impacts during construction of the project, the types of impacts already experienced by these communities as a result of M4 East and New M5 construction, and subsequent development and implementation of location and activity specific mitigation that considers the consecutive nature of construction at these locations.

The Pyrmont Bridge Road tunnel site (C9) would be located between Parramatta Road and Pyrmont Bridge Road at Annandale on the boundary with the suburb of Camperdown. Construction work at this site and in the vicinity of this site would include the following activities for the M4-M5 Link:

- Construction of a temporary access tunnel for tunnelling works
- Tunnel excavation of the northbound and southbound mainline tunnels (about 100 metres west of the construction site boundary).

No other significant projects that have the potential to interact with the M4-M5 Link to result in cumulative impacts have been identified in the Camperdown area. The management measures identified above and in **Chapter E1** (Environmental management measures) would minimise the combination of impacts from the project which may affect Camperdown residents in the vicinity of the Pyrmont Bridge Road tunnel site (C9) and construction of the mainline tunnels.

C27 Sustainability

This chapter addresses issues raised in community submissions associated with sustainability of the M4-M5 Link Environmental Impact Statement (EIS). Refer to Chapter 27 (Sustainability) of the EIS for the further detail on the sustainability of the M4-M5 Link project.

Contents

C27.1 Ecological sustainable development

Three submitters raised concerns about ecological sustainable development in relation to the M4-M5 Link project. Refer to section 27.4 of the EIS for details of ecological sustainable development.

C27.1.1 Government requirements and consistency with ecological sustainable development

A submission expressed concern that the project does not comply with the government's requirements for ecological sustainable development. A submitter was also concerned that the project would worsen intergenerational equity and cause legacy impacts.

Response

The relevant requirements identified in the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning and Environment (DP&E) relating to sustainability have been addressed in Chapter 27 (Sustainability) of the EIS.

In NSW, the commitment to the concept of ecologically sustainable development is expressed in current legislation. It is an object of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) (section 5 (a) (vii)) to encourage ecologically sustainable development. This would be achieved through the implementation of the following four principles of ecologically sustainable development:

- The precautionary principle
- Inter-generational equity
- Conservation of biological diversity and ecological integrity
- Improved valuation and pricing and incentive mechanisms.

The principles of ecologically sustainable development have been an integral consideration throughout the design of the project. This includes the effective integration of the economic and environmental considerations in the decision making process, as defined by section 6(2) of the *Protection of the Environment Administration Act 1991* (NSW).

The precautionary principle has been applied during the design and development of the project through the alternatives and options analysis, adopting a conservative approach to evaluation of environmental impacts and identifying and considering potential environmental risks associated with the project to ensure that an appropriate amount of time was afforded for the detailed specialist studies carried out as part of the environmental assessment (refer to Chapter 28 (Environmental risk analysis) of the EIS). Safeguards and management measures have been developed to manage and reduce impacts identified in these assessments (see **Chapter E1** (Environmental management measures)). Refer to section 27.4.1 of the EIS for further information on how the project has applied the precautionary principle. See **section C27.1.2** for a discussion on issues raised on the precautionary principle.

The project has considered inter-generational equity with the management of potential environmental impacts discussed throughout the EIS (refer to section 27.4.2 of the EIS). The project is anticipated to contribute to inter-generational equity through improved connectivity, reduced congestion, as well as facilitating urban renewal and future economic growth.

Specific examples of project outcomes that support the principle of inter-generational equity include:

- During construction and operation of the project, opportunities would continue to be sought to reduce material use and maximise the use of materials with low embodied environmental impact, where practical
- In terms of air quality impacts and its impact on future generations, under expected traffic conditions, the contribution of project tunnel ventilation outlets to pollutant concentrations was found to be negligible for all sensitive receivers identified. Exceedances of some air quality criteria were predicted to occur at a small proportion of sensitive receivers both with and without the construction of the M4-M5 Link. However, the total number of receivers with exceedances is anticipated to decrease slightly with the project and in the cumulative scenarios. Where increases

in pollutant concentrations at receptors were predicted, these were mostly small (refer to section 9.7 of the EIS for the assessment of potential operational air quality impacts)

- Notwithstanding the project benefits and the renewable energy targets (that would apply as part of either national or state legislation) or the environmental management measures (see environmental management measure OGHG9 in **Chapter E1** (Environmental management measures)), the project may have an impact on inter-generational equity through the consumption of non-renewable fuel resources during operation. As road transport is a significant and necessary element of the NSW economy that also provides many social benefits, NSW Roads and Maritime Services (Roads and Maritime) would continue to ensure that all potential impacts on this system, such as peak oil, are identified and action is taken to manage these risks.

Conservation of biological diversity and ecological integrity is a fundamental consideration of the project. The design and assessment of the project has been undertaken with the aim of identifying, avoiding, minimising and mitigating potential biodiversity and ecological impacts. This EIS provides a detailed biodiversity assessment, which identifies potential impacts on biodiversity, and provides a range of mitigation measures to further avoid and minimise potential impacts on biodiversity. Refer to section 27.4.3 of the EIS for further detail on how conservation of biological diversity and ecological integrity has been applied to the project and Chapter 18 (Biodiversity) and Appendix S (Technical working paper: Biodiversity) of the EIS for further detail on the biodiversity assessment.

The principle of improved valuation, pricing and incentive mechanisms has been demonstrated in the design features incorporated into the project and the management measures to be implemented during construction and operation. Specific examples of design features include relocating the Rozelle interchange to be predominantly below ground to reduce surface impacts, creation of additional open space and the realignment of the mainline tunnels to avoid impacts on heritage conservation areas and heritage items, where possible. Environmental impacts have been avoided or minimised where practical during the design development for the project. Environmental management measures provided in **Chapter E1** (Environmental management measures) will be implemented during construction and operation of the project. Additionally, the costs associated with the planning and design of measures to avoid/minimise adverse environmental impacts and the costs to implement them have been included in the overall project costs. Refer to section 27.4.4 to the EIS for further detail on how the principle of improved valuation and pricing and incentive mechanisms has been applied to the project.

C27.1.2 Consistency with the precautionary principle

A submitter was concerned that aspects of the air quality and health assessments were not carried out in line with the precautionary principle. Areas of concern included:

- Not considering ultrafine particles in the assessments on the basis that there are no existing Australian criteria for ultrafine particles and no ambient data
- Not considering black carbon in the assessments, due to little data being available and no health criteria
- Predication of the effect on ozone generation resides with the proponent.

Response

Section 6(2)(a) of the *Protection of the Environment Administration Act 1991* (NSW) states the following in regards to the precautionary principle:

'The precautionary principle-namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options'.

The precautionary principle has been applied to both the air quality and human health risk assessments in the EIS through the conservative approach undertaken for the modelling. Both the air quality and human health assessments considered risk-based consequences of the project. Examples of applying a conservative and risk-based approach, as per the precautionary principle, to the air quality assessment include:

- One type of modelling scenario undertaken in the air quality assessment consisted of the regulatory worst case scenarios. The objective of regulatory worst case scenarios was to demonstrate that compliance with the concentration limits for the tunnel ventilation outlets would deliver acceptable ambient air quality to the surrounding receptors. The scenarios assessed emissions from the ventilation outlets only. This represented the theoretical maximum changes in air quality for all potential traffic operations in the tunnel, including unconstrained and worst case traffic conditions from an emissions perspective, as well as vehicle breakdown situations. The results of this analysis demonstrated the air quality performance of the project if it operates continuously in the worst operating conditions. In reality, ventilation outlet concentrations would vary over a daily cycle due to changing traffic volumes and tunnel fan operation. This assessment is therefore very conservative, and provided results in emission contributions from project ventilation outlets that would be much higher than those that would occur under usual operational conditions in the tunnel
- Consideration was also given to the potential cumulative impacts of the project with the other component projects of the WestConnex program of works and other related major infrastructure projects that are likely to be operational within 10 years of the opening of the project. By including potential projects, a worst case scenario was assessed, even if some future projects are not approved
- Air quality data from a number of the NSW Office of Environment and Heritage (OEH) and Roads and Maritime sites was assessed and analysed within the EIS. Using current background information for future air quality scenarios (beyond 2023) is a conservative estimate. Based on trends over the last few decades, the contribution of road vehicles to pollution levels in Sydney has fallen. This is because of improvements to fuels and pollution management systems on vehicles. New less polluting vehicles replace older polluting vehicles over time. This has led to a reduction in vehicle generated pollution even with traffic growth and it is expected that this will continue to happen for some time into the future.

In NSW, the statutory methods used for assessing air pollution from stationary sources are listed in the NSW Environment Protection Authority (NSW EPA) Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA 2016). These criteria include the latest (2016) Updated NSW EPA Approved Methods for particulate matter.

The project was assessed against the air quality criteria listed in the updated Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA 2016) (updated Approved Methods). The updated Approved Methods adopted The National Environment Protection (Ambient Air Quality) Measure (AAQNEPM) standards, which ensure compliance with air quality standards, in order to attain 'ambient air quality that allows for the adequate protection of human health and wellbeing'.

There are currently no standards for assessment of 'ultrafine' particles (UFPs) (ie particles with a diameter of less than 0.1 micrometre). As UFPs are a subset of $PM_{2.5}$, the assessment of $PM_{2.5}$ is considered to include the potential impacts of UFPs. This approach is in line with the World Health Organisation (WHO) Regional Office for Europe (2013) which has stated the following:

'The richest set of studies provides quantitative information for $PM_{2.5}$. For ultrafine particle numbers, no general risk functions have been published yet, and there are far fewer studies available. Therefore, at this time, a health impact assessment for ultrafine particles is not recommended'.

Criteria for black carbon, a component of $PM_{2.5}$, is not listed in the NSW EPA Approved Methods for particulate matter. There is therefore no project criteria established for black carbon. However, as black carbon is a component of $PM_{2.5}$, the assessment of $PM_{2.5}$ is considered to include the potential impacts of black carbon.

Refer to section 9.2.6 of the EIS for further information on the pollutants and metrics not assessed including ultrafine particles.

As a result of its secondary and regional nature, ozone cannot practicably be considered in a local air quality assessment. Emissions of ozone precursors (oxides of nitrogen (NO_X) and volatile organic compounds (VOCs)) are distributed unevenly in urban areas, and concentrations vary during the day. Complicating this further are the temporal and spatial variations in meteorological processes. Ozone formation is non-linear, so reducing or increasing NO_X or VOC emissions does not necessarily result in an equivalent decrease or increase in the ozone concentration. This non-linearity makes it difficult to develop management scenarios for ozone control (NSW Department of Environment, Climate Change and Water, 2010b). Ozone was, however, considered in the regional air quality assessment. The results of the regional air quality assessment are discussed in section 9.8 of the EIS. Overall, it was concluded that the regional impacts of the project would be negligible, and undetectable in ambient air quality measurements at background locations.

See **Chapter C9** (Air quality) and **Chapter C11** (Human health risk) for responses to issues raised by the community on air quality and human health risks.

In summary, the EIS has assessed the threat of serious or irreversible environmental damage and project decisions have been guided by the evaluation and (risk based) assessment of impacts. Although there is no criteria available for the assessment of UFPs and black carbon, the EIS included an assessment of $PM_{2.5}$, which is considered to include the potential impacts of UFPs and black carbon.

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C28 General

This chapter addresses issues raised in community submissions associated with general concerns about the M4-M5 Link project. Specific issues raised are addressed in the remainder of **Part C** (Response to community submissions).

Contents

C28.1 General environment

69 submitters raised issues regarding general environmental impacts of the project.

C28.1.1 General environmental concerns

Submitters raised general concerns with regards to environmental impacts on the immediate project footprint and surrounding areas (such as Haberfield, St Peters, Rozelle and North Annandale) as well as across Sydney. Submitters were concerned about impacts on residents, childcare centres and schools during construction and into the future, including traffic congestion and pollution.

A submitter was also concerned with the general environmental impacts of the Darley Road civil and tunnel site (C4).

Response

The WestConnex program of works is part of an integrated transport solution to the increasing pressure on Sydney's transport network. The WestConnex program of works, including the project, would facilitate improved connections between western Sydney and Sydney Airport and Port Botany (via the St Peters interchange and the proposed future Sydney Gateway project), as well as better connectivity between key employment hubs and local communities. The project would help deliver the transport connectivity required to meet future urban growth expectations as part of the transformation of Greater Sydney. The strategic context for the project is discussed in Chapter 3 (Strategic context and project need) of the EIS.

The EIS included the preparation of a range of detailed technical studies. These technical studies were prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) as well as industry standards and guidelines. Project objectives and how they would be achieved are described in section 30.1.2 of the EIS.

The detailed studies to identify potential environmental impacts associated with the project, including impacts at Haberfield, St Peters, Rozelle, North Annandale and across Sydney more generally, are included in Appendix H to X of the EIS and summarised in Chapters 8 to 25 of the EIS. Environmental concerns raised by submitters during the public exhibition of the EIS have also been addressed throughout this Submissions and preferred infrastructure report. Each of the assessments presented in the EIS makes clear reference to the receivers and communities which may be affected by the project. The assessments provide details of the anticipated level of impact, its level of acceptability relative to established, applicable assessment criteria and presents appropriate mitigation measures for the identified impacts.

Identified impacts from the construction and operation of the M4-M5 Link project would be managed in accordance with the environmental management measures identified in **Chapter E1** (Environmental management measures). These management measures aim to ensure the best possible environmental outcomes are achieved during construction and operation of the project, and would adhere to relevant industry standards and guidelines. For example, a proposed measure to manage air quality impacts during construction would be favouring the use of mains electricity over diesel or petroleum powered generators, where practicable, to reduce air emissions from construction sites. Further opportunities to reduce impacts from the project will be refined during detailed design and construction planning.

A discussed in **section 3.4** and Appendix H (Technical working paper: Traffic and transport) of the EIS, a number of key benefits and improvements are forecast as a result of the project:

- Non-motorway roads in the Inner West local government area (LGA) are forecast to experience faster trips with the daily average speed increasing by about 10 per cent. Similarly, the vehicle distance travelled on non-motorway roads is forecast to reduce by about 12 per cent. This indicates that on average, these trips are fewer in number and faster
- Improved network productivity on the metropolitan network, with more trips forecast to be made or longer distances travelled on the network in a shorter time. The forecast increase in vehicle kilometres travelled (VKT) and reduction in vehicle hours travelled (VHT) is mainly due to traffic using the new motorway, with reductions in daily VKT and VHT also forecast on non-motorway roads

- The project, along with investment in other road, public transport and active transport projects, would help to accommodate the forecast growth in population and travel demand in the Sydney metropolitan area
- Reduced travel times are forecast on key corridors, such as between the M4 Motorway corridor and the Sydney Airport/Port Botany precinct
- Reduced traffic is forecast on sections of major arterial roads including City West Link, Parramatta Road, Victoria Road, King Street, King Georges Road and Sydenham Road
- Around 2,000 heavy vehicles are forecast to be removed from Parramatta Road, east of the M4 East Parramatta Road ramps, each weekday.

Where the project would connect to the existing road network, increased congestion is forecast in parts of Mascot, along Frederick Street at Haberfield, Victoria Road north of Iron Cove Bridge, Johnston Street at Annandale and on the Western Distributor. A number of these areas are forecast to improve when the proposed future Sydney Gateway and the proposed future Western Harbour Tunnel and Beaches Link are completed and operational.

Investment in the M4-M5 Link, together with the other WestConnex component projects, would assist in facilitating the delivery of other major city-shaping improvements, such as the Parramatta Road Corridor Urban Transformation and The Bays Precinct Transformation, which would all contribute to delivering economic growth. As part of the broader WestConnex program of works, the project would support NSW's major sources of economic activity and provide a strategic response to the future transport demands on the already congested road network, which includes the A3 corridor.

The project would enhance the environment through:

- Allowing for improved efficiency of the road network and predicted travel time savings, resulting in lower vehicle emissions, a long term reduction in greenhouse gas emissions and an overall improvement in air quality
- Delivering up to 10 hectares of new open space at the Rozelle interchange
- Enhancing pedestrian and cycleway infrastructure around Rozelle, thereby improving social welfare by providing greater connectivity for cyclists and pedestrian journeys.

The potential impacts associated with the Darley Road civil and tunnel site (C4) are discussed in various environmental impact assessment sections in the EIS. Responses to issues raised in submissions in relation to the Darley Road civil and tunnel site (C4) are included in **Chapter C4** (Project development and alternatives) through to **Chapter C26** (Cumulative impacts) of the EIS.

C28.2 Endorsement of other submissions

23 submitters expressed their endorsement of other submissions

C28.2.1 Endorsement of other submissions

Submitters expressed their endorsement of other submissions, which included issues over a variety of environmental aspects and locations.

Response

The issues raised in these submissions have been addressed in the relevant sections of this report throughout **Part B** (Response to key stakeholder submissions), **Part C** (Response to community submissions), **Part D** (Preferred infrastructure report) and **Part E** (Environmental management measures and conclusion).

C28.3 General support

Eight submitters expressed general support for the project.

C28.3.1 Support for the project

Submitters expressed general support for the project, including the project outcome of reducing traffic congestion, removing traffic from surface roads and connecting Sydney's motorway network.

Response

The support for the project is noted.

C28.4 General objection

101 submitters raised issues regarding general objections to the project.

C28.4.1 Objection to the project

Submitters raised general objections to the project in whole and/or in part, due to various reasons including the short and long term impacts at local, regional and global level on residents and the community. Submitters also expressed a general concern about the management of impacts and requested consideration of criticism of the project by experts be taken into account. Key local areas of concern included the inner west area generally, southwest Sydney generally, Newtown, Rozelle, Lilyfield, Enmore, Erskineville, Ashfield, Haberfield, St Peters and Rosebery.

Response

The transport network in Sydney is expected to be put under increasing pressure over the next 20 years. *A Plan for Growing Sydney* (NSW Government 2014) indicated that from 2011 to 2031, Sydney's population is forecast to increase from 4.3 to 5.9 million, which equates to an average of 80,000 additional residents per year. Moreover, by 2036, the number of trips made around Sydney each day is forecast to increase by 31 per cent, from 16 to 21 million vehicle trips. This growth will place increasing pressure on the NSW transport network and the key travel demand corridors connecting regional cities and major centres across the greater Sydney metropolitan area.

The road network in the study area for the traffic and transport assessment currently functions under high levels of traffic demand, which often exceeds the operational capacity, especially city bound during the AM peak period. The study area includes some of the most highly congested road corridors in Sydney. Major routes, such as Parramatta Road, City West Link, Victoria Road, Anzac Bridge/Western Distributor, Southern Cross Drive, Princes Highway and King Street experience significant congestion, with resultant increases in travel time and variability, which can cause typical morning and evening peak hours to spread over longer periods.

The current congestion on arterial roads and the missing links in the motorway network impede the efficient flow of traffic to the important economic centres along Sydney's Global Economic Corridor. The Global Economic Corridor extends from the Sydney Airport and Port Botany precinct, through the Sydney central business district (CBD) and North Sydney to Macquarie Park and Sydney's geographical centre, Parramatta, with connections also to the developing economic hubs on the Rhodes peninsular.

The project is listed as a 'high priority initiative' in the *Australian Infrastructure Plan: The Infrastructure Priority List* (Infrastructure Australia 2016). The project is also part of the NSW Government's commitment to deliver WestConnex for Sydney in response to the recommendations from the *State Infrastructure Strategy 2012–2032* (Infrastructure NSW 2012), the *State Infrastructure Strategy Update* 2014 (Infrastructure NSW 2014), the *NSW Long Term Transport Master Plan* (*Transport Master Plan*) (Transport for NSW 2012), the *NSW State Priorities* announced in September 2015 (NSW Government 2015) and the *NSW Freight and Port Strategy* (Transport for NSW 2013).

The WestConnex program of works, which includes the project, has the potential to be a catalyst for major urban renewal and complements *A Plan for Growing Sydney* (NSW Government 2014) and the *Draft Central District Plan*[1] (Greater Sydney Commission 2016). The project also complements the vision established in the *Draft Towards our Greater Sydney 2056* (Greater Sydney Commission 2016) by providing an integrated transport solution to support population and commercial growth in western Sydney.

Investment in the M4-M5 Link, together with the other WestConnex projects, would assist in facilitating the delivery of other major city-shaping improvements, such as outlined in the *Parramatta Road Corridor Urban Transformation Strategy* (UrbanGrowth NSW 2016a) and the *Transformation Plan: The Bays Precinct, Sydney* (UrbanGrowth NSW 2015), which would all contribute to delivering economic growth. Delivery of the *Transformation Plan: The Bays Precinct, Sydney* is intended to be staged and coordinated with the planning and delivery of infrastructure projects including WestConnex. As part of the broader WestConnex program of works, the project would support NSW's major sources of economic activity and provide a strategic response to the future transport demands on the already congested road network.

A number of key benefits and improvements are forecast as a result of the project:

- Non-motorway roads in the Inner West LGA are forecast to experience faster trips with the daily average speed increasing by about 10 per cent. Similarly, the vehicle distance travelled on non-motorway roads is forecast to reduce by about 12 per cent. This indicates that on average, these trips are fewer in number and faster
- Improved network productivity on the metropolitan network, with more trips forecast to be made or longer distances travelled on the network in a shorter time. The forecast increase in VKT and reduction in VHT is mainly due to traffic using the new motorway, with reductions in daily VKT and VHT also forecast on non-motorway roads
- The project, along with investment in other road, public transport and active transport projects, would help to accommodate the forecast growth in population and travel demand in the Sydney metropolitan area
- Reduced travel times are forecast on key corridors, such as between the M4 Motorway corridor and the Sydney Airport/Port Botany precinct
- Reduced traffic is forecast on sections of major arterial roads including City West Link, Parramatta Road, Victoria Road, King Street, King Georges Road and Sydenham Road
- Around 2,000 heavy vehicles are forecast to be removed from Parramatta Road, east of the M4 East Parramatta Road ramps, each weekday.

Where the project would connect to the existing road network, increased congestion is forecast in parts of Mascot, along Frederick Street at Haberfield, Victoria Road north of Iron Cove Bridge, Johnston Street at Annandale and on the Western Distributor. A number of these areas are forecast to improve when the proposed future Sydney Gateway and the proposed future Western Harbour Tunnel and Beaches Link are completed.

Investment in the M4-M5 Link, together with the other WestConnex component projects, would assist in facilitating the delivery of other major city-shaping improvements, such as the Parramatta Road Corridor Urban Transformation and The Bays Precinct Transformation, which would all contribute to delivering economic growth. As part of the broader WestConnex program of works, the project would support NSW's major sources of economic activity and provide a strategic response to the future transport demands on the already congested road network, which includes the A3 corridor.

The EIS has been prepared in consideration of all relevant legislative requirements, and assesses key issue impacts during construction and operation objectively and thoroughly to provide confidence that the project would be constructed and operated within acceptable levels of impact. Each of the assessments presented in the EIS (Chapters 8 to 25) makes clear reference to the receivers and communities that may be affected by the project, and provides details of the anticipated level of impact, its level of acceptability relative to established, applicable assessment criteria and presents appropriate mitigation and management measures for the identified impacts. While the development of the project would result in unavoidable impacts during construction and operation, overall, the project would deliver a large number of benefits over the medium to long term, as discussed above.

[1] Note that this draft plan was replaced by the *Revised Draft Eastern City District Plan* (Greater Sydney Commission 2017) after the EIS was exhibited

The environmental management and mitigation measures proposed in **Chapter E1** (Environmental management measures) will minimise adverse environmental impacts during construction and operation of the project as far as is practicable. Environmental management and mitigation measures have been developed to cover all areas impacted by the project including the inner west and southwest Sydney generally. These management measures aim to ensure the best possible environmental outcomes are achieved during construction and operation of the project, and would adhere to industry standards and guidelines. Further opportunities to reduce impacts from the project would be refined during detailed design. Should the project be approved, the proponent (Roads and Maritime) must and will comply with all requirements of the conditions of approval for critical State significant infrastructure.

Lessons learnt from preceding WestConnex component projects and other recent major infrastructure projects in NSW, including feedback from the community, key stakeholders, design and construction contractor(s) and the NSW Department of Planning and Environment, have been considered in the development of the environmental management measures for the M4-M5 Link. As a result, a number of additional measures are proposed compared to the M4 East and New M5 projects.

All issues raised in submissions are addressed in **Part B** (Response to key stakeholder submissions), **Part C** (Response to community submissions).

C29 Other WestConnex projects

This chapter addresses issues raised in community submissions associated with other WestConnex projects.

Contents

C29.1 WestConnex New M5

1,841 submitters raised concerns about the WestConnex New M5 project.

C29.1.1 Inadequacy of the WestConnex New M5 project EIS and approval process

Submitters raised a number of concerns regarding the Environmental Impact Statement (EIS) and approval process for the New M5 project. Specific concerns included:

- Issues were not adequately responded to in the New M5 Submissions and preferred infrastructure report, such as in-tunnel air quality and ventilation
- The EIS was rushed, inaccurate and had underestimated or not assessed impacts, in particular noise, dust and odours, resulting in residents being unaware of the scale of destruction from construction of the New M5 project
- The conditions of approval for the New M5 project have not benefited communities
- The EIS for the New M5 did not adequately plan for integration with public transport, open spaces or filtering of ventilation outlets, or discuss the management of the contaminated landfill at Alexandria during construction
- The EIS for the New M5 project did not address compensation options and assessment of homes damaged by the works
- In Stage 2 of WestConnex, tenders were awarded before project approval which has resulted in payments to the successful contractor for variations to the contract. This demonstrates a very poor approach to the administration of government funds
- The New M5 EIS does not indicate how the impacts of pollution from congestion on human health will be ameliorated or overcome
- The New M5 did not adequately account for the acquisition and removal of housing on May Street at St Peters and the proximity of construction work to apartments on McEvoy Street at Alexandria
- Documentation of adverse health and social and economic impacts caused by the New M5 project has not been sufficient.

Response

The New M5 project is being constructed as a separate project and was subject to its own planning assessment process under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). An EIS for the New M5 project was prepared in accordance with the relevant provisions of the EP&A Act, the relevant provisions of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (NSW) and the NSW and Federal bilateral process under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act). The EIS addressed the Secretary's Environmental Assessment Requirements (SEARs) issued by the Secretary of the NSW Department of Planning and Environment (DP&E) for the New M5 project.

The New M5 EIS assessed strategic alternatives to the project, including investment in public transport and rail improvements, and reviewed different ventilation system options, in line with the New M5 SEARs. The EIS also detailed consultation to date and the future consultation planned at the time that the EIS was being prepared.

The New M5 EIS, including detailed technical studies (including for air quality, social and economic, land use and property, and human health risk), was reviewed by NSW Roads and Maritime Services (Roads and Maritime) subject matter experts, key regulatory agencies and DP&E to confirm that it adequately addressed the SEARs prior to being placed on public exhibition. DP&E also commissioned independent technical peer reviews of key technical studies presented in the EIS to inform its assessment.

DP&E produced an Environmental Assessment Report outlining the findings of their assessment of the project – this is published on the NSW Major Projects website[1]. The New M5 project was approved by the NSW Minister for Planning on 20 April 2016 and the Commonwealth Minister on 11 July 2016. Further information on the New M5 including the details of the EIS and conditions of approval can be found on the WestConnex website[2].

The approval for the New M5 project was on the basis that the proposed mitigation measures and conditions of approval would be implemented by the proponent, Roads and Maritime. In developing the New M5, the NSW Government has endeavoured to identify and pursue reasonable opportunities to streamline project delivery in recognition of the project's strategic importance to the NSW economy and state productivity. This included the carrying out of some preparatory works, including the engagement of a design and construction contractor during the preparation of the EIS. The contractor's design and preliminary construction methodology formed the basis of the preferred design assessed in the EIS.

During the development of the New M5, the acquisition of properties in the vicinity of the project corridor was required to facilitate construction of the project and this was described and assessed in the New M5 EIS.

C29.1.2 Justification and need for the New M5 and benefits of the New M5

Submitters raised concerns regarding the justification for building the New M5 project. Specifically, the following concerns were raised:

- The New M5 project was politically driven by a contribution from the Commonwealth Government. There is no need for Stage 2 of WestConnex
- Based on the conceptual example of a rail corridor above the M5 Motorway, the New M5 is not needed
- The New M5 will not solve congestion issues.

Response

The New M5 EIS described the strategic context and need for the project, including an assessment of strategic alternatives and an assessment of the project against the project objectives. The New M5 Submissions and preferred infrastructure report include responses regarding:

- Justification and need for the project in section 5.3.1
- Project cost and funding – New M5 and WestConnex in section 5.3.2
- WestConnex business case in section 5.3.4
- Benefit cost ratio in section 5.3.9
- Traffic and transport impacts in section 5.8.

The New M5 EIS and Submissions and preferred infrastructure report identifies that the New M5 project would:

- Provide additional motorway capacity along the main connection to Sydney Airport, Port Botany and southwest Sydney which would provide reliability and savings in travel time for through traffic
- Provide improved access and connectivity between employment and population centres as well as for local vehicle trips and for active transport
- Enable improvements to public transport including more frequent cross-regional bus services connecting to Sydney Airport
- Facilitate local road upgrades in St Peters and Mascot.

The project would also increase network resilience along the M5 Motorway corridor by providing an alternative to the M5 East Motorway. This would provide network resilience in the event of incidents or planned maintenance on the M5 East Motorway.

[1] http://majorprojects.planning.nsw.gov.au/
[2] www.westconnex.com.au

C29.1.3 Construction impacts of the WestConnex New M5 project

Submitters raised a number of concerns about the construction phase of the New M5 project, including impacts on residents from dust, noise, vibration and traffic. In particular, the following concerns were raised:

- Working hours:
  - Impacts from out-of-hours construction work that has occurred
  - Promises of noise mitigation measures from night works during the construction of the New M5 have not offered adequate protection for residents resulting in physical and mental stress for many residents through a loss of sleep from frequent night works with no respite
  - Notification from contractors of necessary breaches of normal working hours has not been provided to residents
- Conditions of approval:
  - Concerns over conditions of approval for the New M5 with construction management of the contaminated landfill causing worse than expected impacts at Alexandria
  - The conditions of approval for the New M5 have not minimised impacts on communities. Instead, impacts are worse than expected
  - Conditions of approval have been disregarded by the proponent
- Community consultation:
  - Lack of respect from Sydney Motorway Corporation (SMC) in responding to complaints about the construction of the New M5, including a lack of empathy and fairness in the management of construction impacts with mitigation measures being disproportionally applied leaving vulnerable residents exposed. Affected residents are being refused assistance on the basis that they are considered not sufficiently affected
  - Out-of-hours construction noise without respite periods and without adequate notice has resulted in residents experiencing interrupted sleep with unsatisfactory responses to their concerns
  - Many residents, especially the most vulnerable such as those in rental properties or in public housing, are unwilling to complain about impacts experienced
  - Response from the NSW Department of Education has not been satisfactory in relation to the impact of the construction of the New M5 on children at St Peters Public School
  - Complaints to construction contractors have not been adequately handled and seeking redress for property damage has been difficult
  - Residents have been advised that there are no noise mitigation measures available for construction, measures are only available post-construction
  - Responses to complaints relating to settlement issues have been slow and reluctant, resulting in residents spending their own money to repair their homes
- Management of impacts:
  - Management of utilities, dust and odour, noise and vibration, traffic, property acquisition and contamination has not been effective and been poorly managed during construction of the New M5 at St Peters. The poor management has caused multiple disturbances with potential health implications including toxic dusts, odours and disruption to mains water supply
  - SMC has failed to comply with the environmental protection licences that it was granted as part of previous approvals
  - The release of odours and gasses at the Alexandria landfill were not managed adequately
  - The construction traffic and access management plan for the New M5 has been poorly managed
  - Management of contamination impacts at various locations
  - Management of tree removal, including approval of ‘tree reports’
  - Noise mitigation measures during construction of the New M5 were not enforceable

- Impacts from construction:
  - Construction works are impacting lives and investments from a general lack of understanding and control of construction works leading to poor health and safety outcomes including damage to homes
  - Social impacts from property acquisitions and subsequent emotional impact from demolition of homes and significant buildings including the Rudders Bond Store
  - Damage to habitat of the Green Bell Frog and Golden Bell Frog
  - The widespread reduction in access to footpaths on local roads as a result of the project to allow for increased traffic volumes
  - Loss of employment as a result of the construction of the New M5
  - A negative impact on heritage, community cohesion, liveability and health from construction of the New M5
  - Impact on residents from utility works at St Peters occurring through the night. These works have led to burst water mains and residents' water being disconnected
  - Odours from the St Peters site have been a cause for concern, specifically during rain events
  - It is unethical to widen roads such as Euston Road in front of residents' houses.

Response

Roads and Maritime acknowledge that the M4-M5 Link project has interfaces with both the M4 East and New M5 projects and that these projects are all part of the WestConnex program of works. However, specific impacts associated with the construction of the New M5 project are beyond the scope of the M4-M5 Link project.

The proponent and the New M5 design and construction contractor are required to comply with the conditions of approval and requirements of environment protection licences. The contractor is responsible for managing impacts from their activities, in accordance with an approved Construction Environmental Management Plan (CEMP), and for notifying the community about construction works.

Feedback from the community received during the construction of the New M5 project to date has been considered in the preparation of the environmental management measures for the project. Construction impacts of the New M5 project are also considered in the EIS in relation to cumulative impacts. Cumulative impacts of the M4-M5 Link project and the New M5 project are summarised in Chapter 26 (Cumulative impacts) of the EIS.

The concerns raised regarding the New M5 project construction in submissions received for the M4-M5 Link EIS have been passed on to the New M5 communication and environmental project teams. Any additional issues or concerns about the New M5 project construction can be directed to SMC via the project website[3] or the toll free number (1800 660 248).

C29.1.4 Operational impacts of the WestConnex New M5 project

Submitters raised a number of concerns about the operation of the New M5 project. In particular, the following concerns were raised:

- The New M5 will result in thousands more vehicles per day on the roads to the airport, which are already at capacity
- The St Peters off-ramp will lead to increased traffic on Euston Road and McEvoy Road at Alexandria. This will increase air pollution and traffic noise at a time when the population is growing rapidly
- The St Peters Active Recreation Area is of no value to the community. Sited around a ten-storey motorway and in close proximity to ventilation facilities, this recreation area does not improve the amenity of the area
- A concern that the New M5 will result in a significant decrease in access to public transport at St Peters

[3] www.westconnex.com.au

- Concern that the increase in lanes at the intersection of Alison Road and Anzac Parade will increase risks to children through exposure to pollution and vehicle related injury or death.

Response

Specific impacts associated with the operation of the New M5 project are beyond the scope of the M4-M5 Link project. While Roads and Maritime acknowledge that the New M5 and M4-M5 Link will both operate as part of the WestConnex motorway, the New M5 project was subject to a separate planning assessment process (as discussed in **section C29.1.1**). Operational impacts of the New M5 project are considered in the M4-M5 Link EIS in relation to cumulative impacts only. Cumulative impacts of the M4-M5 Link project and the New M5 project are summarised in Chapter 26 (Cumulative impacts) of the M4-M5 Link EIS.

C29.1.5 Vegetation clearance as a result of the New M5 project

Submitters raised concerns regarding vegetation clearance at Sydney Park including:

- The resulting loss of biodiversity
- Loss of Eucalyptus and Melaleuca trees in Sydney Park and resulting loss of habitat for local birds. Measures should be taken to prevent the loss of these trees
- Impacts to waterfowl and other birds at Sydney Park.

Submitters also raised general concerns about the clearance of vegetation at St Peters and Alexandria to widen local roads to increase traffic capacity.

Response

Vegetation clearing within Sydney Park was assessed in the New M5 EIS (Roads and Maritime 2016). The clearance of established trees, including native species such as Melaleucas, was unavoidable in the required footprint for the New M5 project. Vegetation removal within Sydney Park is being carried out in accordance with the New M5 project conditions of approval and the tree replacement strategy included in the Urban Design and Landscape Plan (UDLP) for the New M5.

Rehabilitation and revegetation measures associated with an overlap in construction footprints of the New M5 and M4-M5 Link projects will be implemented as part of the M4-M5 Link project. Future landscaping works at the Campbell Road civil and tunnel site, located directly south of Sydney Park, will be carried out in accordance with the New M5 project conditions of approval and the tree replacement strategy included in the New M5 UDLP, at the completion of construction of the M4-M5 Link project.

C29.1.6 Cost of the WestConnex New M5 project

Concerns were raised about the increased cost of the New M5. The collateral cost implications to local councils, residents and businesses have not been satisfactory.

Response

The cost of the New M5 project is beyond the scope of the M4-M5 Link project. The size and scale of WestConnex requires the program of works to be delivered in stages, as outlined in the *WestConnex Updated Strategic Business Case* (SMC 2015). The WestConnex program of works is naturally aligned to fit in three construction stages, primarily due to the natural 'break points' where the project can be cost effectively integrated into the surrounding network. As such the New M5 project is being developed as a separate project.

C29.1.7 Suggested opportunities

A submitter noted the opportunity for DP&E to apply policies and practices from the UK Cross Rail project retrospectively to the New M5 project.

Response

The consideration of policies and practices from the UK Cross Rail project are outside the scope of the M4-M5 Link project. Policy changes are a matter for DP&E.

C29.2 WestConnex M4 East

974 submitters raised concerns about the WestConnex M4 East project.

C29.2.1 Inadequacy of the WestConnex M4 East project EIS and approval process

Submitters raised concerns that the M4 East EIS had underestimated or not assessed impacts, in particular of noise, dust and odours. Additionally, submitters were concerned that issues were not adequately responded to in the M4 East Submissions and preferred infrastructure report, such as in-tunnel air quality and ventilation. Specific concerns included:

- The EIS for the M4 East did not address compensation options of homes damaged by the works or adequately assess the scale of destruction required for the construction of the M4 East project
- Tenders were awarded before project approval resulting in payments to the successful contractor for variations to the contract. The contract award prior to project approval resulted in the EIS assessment process not facilitating meaningful community consultation
- At the commencement of the M4 East EIS exhibition period, residents did not have complete information on the project on which to base their submissions. The M4 East Submissions Report refers to information in the *WestConnex Updated Strategic Business Case* of November 2015, but this document was only published after the closing date for the M4 East EIS submissions
- Planning for the M4 East has been insufficient. The environmental impact assessment was rushed, insufficient and inaccurate
- The M4 East Submissions and preferred infrastructure report does not respond equally to submissions. While stakeholder submissions (government agencies and local councils) are addressed individually, responses to community submissions are generic. Submissions by non-government organisations should be responded to in the same way that submissions from government organisations are responded to
- The M4 East did not sufficiently plan for rail, the filtering of ventilation outlets, integration with public transport or improvements to cycling infrastructure
- An independent review of process and assessment should be performed on the M4 East Submissions and preferred infrastructure report
- The M4 East EIS did not adequately address pavement drainage and stormwater treatment issues at Haberfield/Ashfield
- The impacts experienced by residents from the M4 East project shows that the predicted modelling of impacts in the M4 East EIS was flawed
- Documentation of adverse health and social and economic impacts caused by the M4 East project has not been sufficient.

Response

The M4 East project is being constructed as a separate project and was subject to its own planning assessment process under Part 5.1 of the EP&A Act. An EIS for the M4 East project was prepared in accordance with the relevant provisions of the EP&A Act and the relevant provisions of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (NSW). The EIS addressed the SEARs issued by DP&E for the M4 East project.

The M4 East EIS, including detailed technical studies (including for air quality, social and economic, land use and property, and human health risk), was reviewed by Roads and Maritime subject matter experts, key regulatory agencies and DP&E to confirm that it adequately addressed the SEARs prior to being placed on public exhibition. DP&E also commissioned independent technical peer reviews of key technical studies presented in the EIS to inform its assessment.

DP&E produced an Environmental Assessment Report outlining the findings of their assessment of the project – this is published on the NSW Major Projects website[4]. Their assessment concluded that the impacts of the M4 East project had been satisfactorily addressed in the EIS and Submissions and preferred infrastructure report and that the impacts would be acceptable subject to the implementation of the identified mitigation measures and the recommended conditions of approval. The report concluded that the proposal's benefits outweigh its potential impacts and that any residual impacts can be managed and would not, subject to conditions, result in any long term adverse or irreversible effects.

The NSW Minister for Planning approved the M4 East project on 11 February 2016. Further information on the M4 East project including the details of the EIS and conditions of approval can be found on the WestConnex website[5].

C29.2.2 Justification and need for the M4 East

Submitters raised concerns regarding the justification for building the M4 East project. Specifically, the following concerns were raised:

- It is unlikely that the M4 East will draw sufficient traffic off Parramatta Road to significantly improve local amenity and lead to significant urban renewal, unless the capacity of Parramatta Road is reduced significantly
- The M4 East will not solve congestion issues.

Response

The M4 East EIS describes the justification and need for the project, including improvements to traffic along Parramatta Road. Chapter 5 of the M4 East Submissions and preferred infrastructure report discusses concerns regarding impacts on road network performance during operation, including on Parramatta Road.

C29.2.3 Construction impacts of the WestConnex M4 East project

Submitters raised a number of concerns about the construction phase of the M4 East project, including impacts on residents from noise, pollution, traffic, dust, disruption and visual amenity. In particular, the following concerns were raised:

- Working hours:
  - Out-of-hours work during the construction of the M4 East has become a regular occurrence and with no respite, particularly with relation to utilities work and when the schedule has fallen behind. This has led to physical and mental stress, impacting the quality of life for many residents through loss of sleep
  - Spoil haulage hours have differed from what was promised
  - Notification from contractors of necessary breaches of normal working hours has not been provided to residents
- Conditions of approval:
  - Contractors have breached the conditions of approval and are not held accountable
  - Breaches of asbestos management has occurred during demolition of houses
  - Conditions of approval for the M4 East have not benefited affected communities
  - The M4 East Residual Land Management Plan condition of approval should be modified prior to any M4-M5 Link construction being approved
  - Road closures have occurred without the required notification
  - There has been minimal enforcement of the conditions of approval

[4] http://majorprojects.planning.nsw.gov.au/
[5] www.westconnex.com.au

- Community consultation:
  - Lack of respect from SMC in responding to complaints about the construction of the M4 East project. There has been a lack of empathy and respect in the management of construction impacts
  - Complaints from residents about unsatisfactory levels of noise, vibration, dust and other pollutants have been met with a delayed and generic response or no response at all
  - Many residents, especially the most vulnerable such as those in rental properties or in public housing, are unwilling to complain about impacts experienced
  - Seeking redress for cracking in buildings from tunnelling has been difficult with responses to complaints slow and reluctant
  - Concerns relating to acquisition of residential and commercial property have not been adequately managed
  - Damages to properties at Haberfield haves been poorly managed and subcontractors not held accountable for compensation
  - Cracks and damages in homes that did not appear on dilapidation reports, such as on Walker Street, need to be repaired
  - Requests for investigations into causes of potential cracking in residential homes along with other impacts has been declined
  - Despite following the elected procedures regarding damage to their homes, residents have not had their claims settled and have had to repair their homes at their own expense
  - Families whose homes were acquired as part of the construction of the M4 East project have not been adequately compensated and have been unable to relocate to a home in the same neighbourhood
- Management of impacts:
  - Inadequate noise mitigation measures are in place for night works
  - Mitigation measures for construction noise are inadequate, poorly regulated and inequitably applied with housing development tenants disproportionately affected
  - Utilities work has been poorly managed during the construction of the M4 East, requiring noisy equipment that should not be deemed minor works
  - Ongoing disruptions during construction since 2016 including impacts due to tunnelling, construction traffic and spoil truck haulage has been inappropriately managed
  - Inappropriate management of dust, noise and vibration, heritage, wildlife, vegetation, traffic, odour, noxious gases and toxic materials has occurred during construction, affecting the liveability of the area surrounding the project and resulting in adverse health problems
  - SMC has failed to comply with the environment protection licence that was granted as part of approvals
  - There have been several breaches in the management of asbestos contaminated soil during the construction of the M4 East project
  - Access restrictions to local roads have not been enforced as construction vehicles use restricted roads regularly
  - Action has not been taken to ensure workers use designated worker parking
  - Unhappy that suggestions made by the Walker Avenue Residents group about visual impacts has been ignored by the contracted construction company
- Impacts from construction including noise, dust, disruption and specifically:
  - Changes to parking provisions due to construction vehicles resulting in parking congestion
  - Works to footpaths and roads around construction sites has involved unnecessary repetition of excavation works and closures
  - Limited access to residential properties due to road dividers

  - Loss of employment as a result of construction of the project
  - Increase in vehicle and truck movements from the construction impacting local residents
  - Works have been uncoordinated between the WestConnex contractor and utility companies
  - Property acquisition has had a negative impact on community cohesion
  - Local businesses have been negatively impacted financially but have not been sufficiently compensated
  - There has been a lack of understanding and control of the build, which has led to poor health and safety outcomes
  - Communities have been destroyed through the demolition of houses, apartment blocks, trees and gardens including 50 per cent of apartments at Haberfield
  - Negative impacts on children and staff at Haberfield Public School due to increased noise, vibration, dust, traffic and disruption
  - Increase in traffic on local roads through rat-running has been encouraged through the use of electronic street signs identifying areas of construction congestion
  - Decrease in vegetation as a result of the project has resulted in an increased heat burden in suburbs surrounding the project
  - Haberfield has been divided physically, many Federation homes have been destroyed and residents have been displaced. Years of work to restore these properties have been negated
  - The placement of a barrier on Walker Avenue at Haberfield, is increasing the risk of road accidents due to vehicles regularly speeding along this street
  - Damage to footpaths at Northcote Street, Alt Street, Martin Street, Waratah Street and Reg Coady Reserve has had adverse effects on the community
  - Local roads blocked off for construction have resulted in residents facing long diversions for local travel, often requiring travel on busier arterial roads
  - Increases in traffic on local roads due to construction of the M4 East has resulted in a dangerous environment for children
  - Decreases in property value due to construction of the M4 East project and associated infrastructure including electronic signage
  - Construction of the M4 East has resulted in increased cases of asthma.
- Design of the M4 East
  - The electrical substation at Haberfield should be relocated under existing roads rather than existing properties, as a precaution to health impacts
  - Uncertainty over the rationale for the movement of the bus stop on Northcote Street.

Response

Specific impacts associated with the construction of the M4 East project is beyond the scope of the M4-M5 Link project. The M4 East project is being developed as a separate project and was subject to its own planning assessment process including EIS preparation and exhibition and Submissions and preferred infrastructure report (as discussed in **section C29.2.1**).

Feedback from the community received during the construction of the M4 East project has been considered in the preparation of the environmental management measures in the M4-M5 Link EIS. Construction impacts of the M4 East project are considered in the M4-M5 Link EIS in relation to cumulative impacts only. Cumulative impacts of the M4-M5 Link project and the M4 East project are summarised in Chapter 26 (Cumulative impacts) of the EIS and in **Chapter C14** (Social and economic) and **Chapter C26** (Cumulative impacts).

The proponent and the M4 East construction contractor are required to comply with the conditions of approval and requirements of environment protection licences. The construction contractor is responsible for managing impacts from their activities in accordance with an approved CEMP and for notifying the community about construction works.

The concerns raised regarding the M4 East project construction have been passed on to the M4 East communication and environmental project teams. Any issues or concerns about the M4 East project construction can be directed to SMC via the WestConnex website[6] or the toll free number (1800 660 248).

C29.2.4 Cost of the WestConnex M4 East project

A submitter is concerned about the increased cost of the M4 East project. The collateral cost implications to local councils, residents and businesses have not been satisfactory.

Response

The cost of the M4 East project is beyond the scope of the M4-M5 Link project. The size and scale of WestConnex requires the program of works to be delivered in stages, as outlined in the *WestConnex Updated Strategic Business Case* (SMC 2015a). The WestConnex program of works is naturally aligned to fit in three construction stages, primarily due to the natural 'break points' where the project can be cost effectively integrated into the surrounding network. As such the M4 East project is being developed as a separate project.

C29.2.5 Suggested opportunities

The following suggestions were made by submitters:

- There is an opportunity for the M4 East project to improve the links between Ashfield and Haberfield for active transport users
- There is an opportunity for DP&E to apply policies and practices from the UK Cross Rail project retrospectively to the M4 East project
- The coordination and integration between all WestConnex projects should be ensured in the event of a disaster.

Response

Although separate planning applications and assessments have been completed, the WestConnex program of works has been coordinated to facilitate improved connections between western Sydney, Sydney Airport and Port Botany and south and south-western Sydney.

Active transport links for the M4 East project are outside the scope of the M4-M5 Link project. The draft M4 East Urban Design Landscape Plan outlines the active transport links to be provided at Haberfield by the M4 East project.

As discussed in section 5.8.4 of the EIS, a 'single operating entity' would undertake day-to-day 'coordinated operations' for the widened M4 Motorway (M4 Widening project), M4 East, New M5 and M4-M5 Link projects (the 'WestConnex Motorway'), as well as the existing M5 East, from a combined traffic control room located at the St Peters interchange, the WestConnex Motorway Control Centre. This would coordinate resources and systems used to respond to incidents, emergencies and threats across the WestConnex Motorway to provide a rapid and coherent response unconstrained by concession boundaries.

The consideration of policies and practices from the UK Cross Rail project are outside the scope of the M4-M5 Link project. Policy changes are a matter for DP&E.

C29.3 WestConnex King Georges Road Interchange Upgrade

Seven submitters raised concerns about the WestConnex King Georges Road Interchange Upgrade project.

C29.3.1 Construction impacts from the King Georges Road Interchange Upgrade

Submitters raised concerns in relation to the construction phase of the King Georges Road Interchange Upgrade. In particular, the following concerns were raised:

[6] www.westconnex.com.au

- Contractors at Beverly Hills have failed to quarantine and cover outgoing toxic loads such as asbestos, during demolition and excavation
- Home owners at Beverly Hills who have experienced major damage from the King Georges Road interchange works have been denied compensation by both Roads and Maritime and the contractor
- Inadequate landscaping and noise walls at Beverly Hills
- Conditions of approval, including night noise management, community consultation and delivery on promises, has not occurred at Beverly Hills
- Contractors at Beverly Hills have failed to adhere to conditions of approval, including night noise management
- Notification from contractors of necessary breaches of normal working hours has not been provided to residents.

Response

Specific impacts associated with the construction of the King Georges Road Interchange Upgrade are beyond the scope of the M4-M5 Link project. The King Georges Road Interchange Upgrade was developed and constructed as a separate project and was subject to its own planning assessment process under Part 5.1 of the EP&A Act. The NSW Minister for Planning approved the King Georges Road Interchange Upgrade project on 3 March 2015. The King Georges Road Interchange Upgrade was completed and opened to traffic in December 2016.

The proponent and construction contractor were required to comply with the projects conditions of approval and requirements of the environment protection licence. Feedback from the community received during the construction of the King Georges Road Interchange Upgrade project has been considered in the preparation of the environmental management measures in the M4-M5 Link EIS. Construction impacts of the King Georges Road Interchange Upgrade project are considered in the M4-M5 Link EIS in relation to cumulative impacts only. Cumulative impacts of the M4-M5 Link project and the King Georges Road Interchange Upgrade project are summarised in Chapter 26 (Cumulative impacts) of the EIS and in **Chapter C26** (Cumulative impacts).

C29.4 WestConnex M4 Widening

196 submitters raised concerns about the WestConnex M4 Widening project.

C29.4.1 Inadequacy of the WestConnex M4 Widening project EIS and approval process

Submitters raised concerns that the impacts of the M4 Widening on the people of Granville were underestimated in the EIS.

Response

The WestConnex M4 Widening project was constructed as a separate project and was subject to its own planning assessment process under Part 5.1 of the EP&A Act. The NSW Minister for Planning approved the M4 Widening project on 21 December 2014 and the project opened to traffic in July 2017.

An EIS for the M4 Widening project was prepared in accordance with the relevant provisions of the EP&A Act and the relevant provisions of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (NSW). The EIS addressed the SEARs issued by the Secretary of DP&E for the M4 Widening project.

DP&E produced a Secretary's Environmental Assessment Report in December 2014 outlining the findings of their assessment of the project – this is published on the NSW Major Projects website[7]. Their assessment concluded that the impacts of the M4 Widening project, including on the suburb of Granville, had been satisfactorily addressed in the EIS and Submissions report and the DP&Es recommended conditions of approval. The report concluded that the proposal's benefits outweigh its potential impacts and that any residual impacts can be managed and would not, subject to conditions, result in any long term adverse or irreversible effects.

C29.4.2 Construction impacts from the M4 Widening project

Submitters raised concerns about the construction phase of the M4 Widening project. In particular, the following concerns were raised:

- Noise impacts from construction have not been minimal and mitigation measures have been inadequate
- Disruption to an ibis colony
- Residents impacted by the construction of the M4 Widening have had difficulty obtaining mitigation of construction noise impacts
- There have been several breaches in the management of asbestos contaminated soil during the construction of the M4 Widening project
- Management of asbestos contamination impacts at Granville and Harris Park
- Notification from contractors of necessary breaches of normal working hours has not been provided to residents.

Response

The M4 Widening project is beyond the scope of the M4-M5 Link project. The M4 Widening project was constructed as a separate project and opened to traffic in July 2017. Construction on this project is no longer occurring. Issues regarding construction impacts of this project were addressed in the project's EIS and Submissions report.

C29.4.3 Concerns relating to the M4 Widening project during operation

Submitters are concerned the M4 Widening project has resulted in more congestion at Strathfield. Submitters are also concerned that drivers are choosing to use Parramatta Road instead of paying the tolls on the new M4 Motorway.

Response

While the issues raised are acknowledged and will be considered for the M4-M5 Link project, where relevant, the specific impacts associated with the operation of the M4 Widening project are beyond the scope of the M4-M5 Link project.

C29.4.4 Reinstatement of tolls

A submitter raised concerns regarding the reinstatement of the toll on the M4 Motorway after the completion of the M4 Widening, despite the large revenue gain from selling Transgrid and Ausgrid. The backlash in western Sydney about the reintroduction of the extra lane tax on the M4 Motorway to help fund WestConnex should be noted. The impact on local roads of those unable to pay, or choosing not to pay tolls, is exacerbated by congestion at exits and entrances to freeways, as people exercise their objections to this project.

Response

Specific impacts associated with the operation of the M4 Widening project is beyond the scope of the M4-M5 Link project. The M4 Widening project was complete and open to traffic for one toll-free month in July 2017. Distance-based tolls commenced on the new M4 on 15 August 2017. Section 3.12.3 of the Submissions report for the M4 Widening project outlines tolling arrangements and related impacts. Furthermore, cumulative impacts of tolling on the M4-M5 Link project and the M4 Widening project are summarised in Chapter 26 (Cumulative impacts) of the M4-M5 Link EIS.

[7] http://majorprojects.planning.nsw.gov.au/

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C30 Other Roads and Maritime projects

This chapter addresses issues raised in community submissions associated with other Roads and Maritime projects excluding WestConnex projects. Issues associated with WestConnex projects have been addressed in **Chapter C29** (Other WestConnex projects).

Contents

C30.1 Western Harbour Tunnel and Beaches Link

132 submitters raised issues regarding the Western Harbour Tunnel and Beaches Link program of works.

C30.1.1 Concerns relating to the Western Harbour Tunnel and Beaches Link program of works

Submitters were opposed to the Western Harbour Tunnel project, raising the following as concerns:

- Changes in air quality may diminish local amenity and affect public health
- That the additional ventilation facilities associated with the Western Harbour Tunnel project will be located on the Balmain Peninsula and Goat Island, which will drift pollution towards Rozelle
- Rat-running and impact on local streets at Camperdown
- Impact on heritage communities and items in the inner west
- Impact on open space and parkland
- Lack of community consultation with regard to the Western Harbour Tunnel and Beaches Link program of works
- The proposed Western Harbour Tunnel project is poorly integrated into the strategic positioning of the Sydney motorway network
- The Western Harbour Tunnel project will result in extended gridlock on Victoria Road, Anzac Bridge and City West Link and will worsen congestion. Propose that the tunnel be moved further west to align with Lane Cove Road so this congestion is avoided
- The Western Harbour Tunnel should be confined below main arterial roads and unused lands to minimise the impact on local communities
- The Western Harbour Tunnel proposal should be replaced with an extension of Iron Cove Link to join the M2 Motorway at Lane Cove River
- Concern that there has been inadequate planning for the proposed program of works. Many involved in the planning phase were unaware of the extensive network of old coal mines and shafts under the Balmain and Long Nose Point Peninsula
- Public transport alternatives need to be assessed as a feasible alternative to the Western Harbour Tunnel project
- A rail alternative to the Western Harbour Tunnel and Beaches Link program of works, should be considered in the same detail as the current proposal
- Traffic modelling shows severe degradation to City West Link if the Western Harbour Tunnel project is connected
- General concerns and objections towards the Western Harbour Tunnel and Beaches Link program of works
- There is insufficient connectivity between the Drummoyne peninsula and the Western Harbour Tunnel project. Traffic from Drummoyne wishing to access the Western Harbour Tunnel would have to travel along Victoria Road and the Western Distributor to access the tunnel
- Concern that if construction of the Cross Harbour Tunnel [Western Harbour Tunnel] does not begin until the M4-M5 Link is complete, the completion date for the project will be pushed back to 2030
- The Western Harbour Tunnel and Beaches Link program of works is included in the WestConnex concept, but the impact of this component has been hidden from public scrutiny
- Planning for the Western Harbour Tunnel project is incomplete, and it is not clear how this project will be funded
- The Western Harbour Tunnel and Beaches Link program of works will not solve congestion issues

- The Western Harbour Tunnel and Beaches Link program of works have not been funded, designed or modelled yet
- Details regarding the Western Harbour Tunnel and Beaches Link program of works and its business case have not been made available to the public and hence, should not be considered.
- Concern over the operational traffic impacts of the entry and exit ramps of the Western Harbour Tunnel and Beaches Link projects.

Submitters raised a number of questions regarding the Western Harbour Tunnel project and its reliance on the M4-M5 Link. Specific questions include:

- Considering the reliance of the Western Harbour Tunnel project on the M4-M5 Link, why is the Western Harbour Tunnel project not part of WestConnex
- Concern that the Western Harbour Tunnel proposal is causing complexities at the Rozelle interchange
- Congestion created by the construction of the M4-M5 Link will be used as justification for the Western Harbour Tunnel and Beaches Link program of works.

Submitters objected to the Beaches Link project, raising the following concerns:

- The proposed Beaches Link project has not considered public transport options
- Concerns for the health of children
- Lack of community consultation
- The inability to use GPS navigation within the tunnel.

Submitters suggested that future technological advancements to public transport, in particular to bus services, including high capacity, frequent driverless vehicles, would increase commuter capacity and reduce the need for the Western Harbour Tunnel project. Alternatively, light rail or electric bicycles could provide an alternative to the project.

Response

The proposed future Western Harbour Tunnel and Beaches Link program of works are not part of the WestConnex program of works. The Western Harbour Tunnel and Beaches Link program of works includes the proposed future 'Western Harbour Tunnel and Warringah Freeway Upgrade' project (the Western Harbour Tunnel project), and the proposed future 'Beaches Link and Gore Hill Freeway Connection' project (the Beaches Link project). These are both separate projects and as such have their own business case and are subject to their own environmental approval process. Both projects are currently in the early planning and design stage. Details surrounding project need, justification, alternatives, cost and funding would be addressed within the environmental impact assessments for these projects.

Civil construction of elements of tunnels, ramps and associated infrastructure to provide connections to the proposed future Western Harbour Tunnel project are included as part of the M4-M5 Link project. The Western Harbour Tunnel has been considered as part of the M4-M5 Link project only to the extent that it relates to meeting the broader strategic objectives of the WestConnex program of works and in relation to cumulative impacts.

Chapter 12 of Appendix H (Technical working paper: Traffic and transport) of the EIS details the forecast traffic performance of the study area during the cumulative scenarios. The detailed assessments have been undertaken using forecast traffic volumes produced using the WRTM for the following scenarios:

- **Operation 'Cumulative' (2023)**: With the 'Do minimum' projects completed, the M4-M5 Link complete and open to traffic, and in addition, the proposed future Sydney Gateway and the proposed future Western Harbour Tunnel (a component of the proposed future Western Harbour Tunnel and Beaches Link project) operational
- **Operation 'Cumulative' (2033)**: With the 'Do minimum' projects completed, the M4-M5 Link complete and open to traffic, and in addition, the proposed future Sydney Gateway, Western Harbour Tunnel and Beaches Link and F6 Extension projects operational.

Three other major NSW Roads and Maritime Services (Roads and Maritime) projects are currently in planning and have been included in the cumulative assessments:

- Proposed future Sydney Gateway
- Proposed future Western Harbour Tunnel and Beaches Link
- F6 Extension.

These projects are subject to separate environmental assessment and approval.

These cumulative scenarios were modelled and assessed in the EIS in the following chapters: traffic and transport (refer to section 8.3.4); air quality (refer to section 9.7); and noise and vibration (refer to section 10.4). Cumulative impacts of the M4-M5 Link project and the proposed future Western Harbour Tunnel and Beaches Link are summarised in Chapter 26 (Cumulative impacts) of the EIS.

Further information on the Western Harbour Tunnel and Beaches Link program of works has been made public since the cumulative impact assessment for the M4-M5 Link EIS was undertaken. The Western Harbour Tunnel and Beaches Link program of works consists of two components: the Western Harbour Tunnel and Warringah Freeway Upgrade project and the Beaches Link and the Gore Hill Freeway Connection project.

Scoping reports for these two projects have been submitted to DP&E with SEARs issued to the proponent on 15 December 2017. EISs for each project are being prepared. The Scoping Report for the Western Harbour Tunnel and Warringah Freeway Upgrade project includes mention of a connection to the surface road network at Rozelle. While the construction impact of the proposed future Western Harbour Tunnel entry and exit ramps at the Rozelle interchange is included in this EIS, a comprehensive operational traffic impact of these ramps is not part of this EIS. Due to the ongoing development of the proposed future Western Harbour Tunnel and Beaches Link project, this would be assessed in the future Western Harbour Tunnel and Beaches Link EIS.

However, a high level assessment of potential impacts associated with the proposed future Western Harbour Tunnel and Beaches Link surface ramps at City West Link is provided in section 12.5.8 of Appendix H (Technical working paper: Traffic and transport) of the EIS. The assessment indicates that there is likely to be some reduction in traffic on the Western Distributor and Sydney Harbour Bridge, as more traffic would be able to access the proposed future Western Harbour Tunnel and Beaches Link. However, there is likely to be increased traffic on City West Link, The Crescent and Johnston Street. The impacts of these surface ramps would be assessed in detail as part of future environmental assessment for the proposed future Western Harbour Tunnel and Beaches Link to be carried out by Roads and Maritime.

C30.2 Sydney Gateway

Seven submitters raised issues regarding the Sydney Gateway project.

C30.2.1 Concerns relating to the Sydney Gateway project

Submitters raised concerns regarding the proposed Sydney Gateway project. Specific concerns included:

- Request for traffic modelling in the vicinity of the airport
- Request for consultation strategies that are being devised with relevant stakeholders, especially Sydney Airport Corporation, and surrounding councils
- To improve congestion, the state government should instead buy out the private owners of the Sydney airport rail line and reduce ticket prices
- The Sydney Gateway project has not been funded, designed or modelled yet
- There is no information or preliminary design available, which raises questions about whether the project is feasible, particularly given the technical challenges involved
- Concern that the traffic at the airport would become more congested with the Sydney Gateway
- Concern that construction of the Sydney Gateway would result in delays in other planned Sydney motorways including the Western Harbour Tunnel project.

Response

Specific elements associated with the construction and operation of the proposed future Sydney Gateway project are beyond the scope of the M4-M5 Link project. The Sydney Gateway project is being developed as a separate project and would be subject to a separate environmental impact assessment process to meet the appropriate legislative requirements. Discussion of project options, alternatives, design and associated impacts of the Sydney Gateway project would be addressed in the environmental impact assessment for that project.

Chapter 12 of Appendix H (Technical working paper: Traffic and transport) of the EIS details the forecast traffic performance of the study area during the cumulative scenarios. The detailed assessments have been undertaken using forecast traffic volumes produced using the WRTM for the following scenarios:

- **Operation 'Cumulative' (2023)**: With the 'Do minimum' projects completed, the M4-M5 Link complete and open to traffic, and in addition, the proposed future Sydney Gateway and the proposed future Western Harbour Tunnel (a component of the proposed future Western Harbour Tunnel and Beaches Link project) operational
- **Operation 'Cumulative' (2033)**: With the 'Do minimum' projects completed, the M4-M5 Link complete and open to traffic, and in addition, the proposed future Sydney Gateway, Western Harbour Tunnel and Beaches Link and F6 Extension projects operational.

Three other major Roads and Maritime projects are currently in planning and have been included in the cumulative assessments:

- Proposed future Sydney Gateway
- Proposed future Western Harbour Tunnel and Beaches Link
- F6 Extension.

These projects are subject to separate environmental assessment and approval.

The proposed future Sydney Gateway project was included in the 2023 and 2033 cumulative scenario modelled and assessed in the EIS in the following chapters: traffic and transport (refer to section 8.3.4); air quality (refer to section 9.7); and noise and vibration (refer to section 10.4). Cumulative impacts of the M4-M5 Link project, including consideration of the proposed future Sydney Gateway project, are also summarised in Chapter 26 (Cumulative impacts) of the EIS and **Chapter C26** of this report.

C30.2.2 Support of the Sydney Gateway

Submissions in support of the Sydney Gateway project noted that it would create a direct linkage between Sydney Airport, Port Botany and Sydney's overall motorway network.

Response

The support for the Sydney Gateway project is noted.

C30.3 Rozelle Rail Yards site management works

188 submitters raised issues regarding the Rozelle Rail Yards site management works project.

C30.3.1 Rozelle Rail Yards site management works concerns

Submitters raised concerns that work has already begun at the Rozelle Rail Yards, before the M4-M5 Link project has been approved, including removal of buildings, other rail infrastructure and vegetation. Specific construction concerns include:

- Changes to on-street parking provisions and loss of parking as a result of construction workers
- Out-of-hours noise from the enabling works at the Rozelle Rail Yards is sufficient to cause sleep disturbance along Balmain Road ridge top in Lilyfield
- Increase in dust, impacting on local community, including on human health

- Concerns regarding the works at the Rozelle Rail Yards, including the removal of buildings, rail infrastructure and vegetation. These works should have been assessed within the M4-M5 Link EIS
- The proposal to maintain some of the heritage features at Rozelle Rail Yards has been overturned. The removal of these items has already commenced
- The maintenance works at the Rozelle Rail Yards are undermining the possibility of a new surface light rail extension to White Bay and the Balmain Peninsula. This rail corridor should be preserved for future re-use. A railway could streamline Inner West light rail transit services, bypassing Glebe, the Pyrmont loop and Ultimo, and be used to reduce congestion issues
- Objection to the removal of the lighting tower and the Port Authority buildings, as they are of local significance and are representative of the operation of the Rozelle Rail Yards in the first part of the 20th century.

Response

The site management works do not form part of the M4-M5 Link project. The site management works are required irrespective of whether the M4-M5 Link project is approved and proceeds. Should the M4-M5 Link project not proceed, the site management works would allow the Rozelle Rail Yards to be more effectively managed prior to another land use being developed in the future.

Roads and Maritime, as the owner of the site, is responsible for managing environmental and safety issues at the site, including after the site management works are completed. The site management works will benefit future uses of the site (including construction of the M4-M5 Link project if it is approved) because the works will remove material and redundant facilities associated with rail and rail related infrastructure from the site. The undertaking of these works will allow the establishment of the M4-M5 Link construction ancillary facility at the Rozelle Rail Yards to commence following project approval.

The site management works were subject to a separate environmental assessment. The works were assessed in a Review of Environmental Factors (REF) (Rozelle Rail Yards – Site Management Works, Review of Environmental Factors (Roads and Maritime 2016)). The REF was publicly displayed for 21 days between 23 November and 13 December 2016. Submissions relating to the proposal as assessed in the REF were received from stakeholders and the community during this period. Issues raised in the submissions were addressed in the Rozelle Rail Yards – Site Management Works, Submissions Report (Roads and Maritime 2017e). Roads and Maritime considered the submissions and the project was assessed and approved by Roads and Maritime under Part 5 of the *Environmental Planning and Assessment Act 1979* (NSW) on 10 April 2017.

The following issues are responded to in the Rozelle Rail Yards Site Management Submissions report:

- Potential traffic and parking impacts in chapter 3.12.2
- Potential impacts from dust in chapter 3.14.1
- Risk of contamination of ground water and waterways and risk of asbestos in chapter 2.3.1
- Potential impacts to Fairy Wrens and other birds in chapter 2.6.5
- Potential impacts on non-aboriginal heritage, including the lighting tower and Port Authority building in chapter 3.9.3
- Construction and demolition noise in chapter 3.13.2
- Independent monitoring of activities in chapter 3.19.1.

Roads and Maritime will continue to manage and maintain the site until after construction of the M4-M5 Link project, if approved. Should the project not proceed, the Rozelle Rail Yards would likely be developed in accordance with *The Bays Precinct Transformation Plan* (UrbanGrowth NSW 2015). Site management works have commenced and will occur over a period of around 12 months. After completion of the works the 'finished site' will be managed and maintained to ensure that the surface cover and stormwater controls are operating effectively.

The Rozelle Rail Yards site management works has been considered in the M4-M5 Link EIS as it relates to cumulative impacts. Results of targeted biodiversity surveys that were carried out within the Rozelle Rail Yards to inform the biodiversity assessment for the site management works were used to assess the potential for any additional impacts of the M4-M5 Link project. Cumulative impacts of the M4-M5 Link project and the site management works have been summarised in Chapter 26 (Cumulative impacts) of the EIS. For the purposes of the assessments for the M4-M5 Link EIS, it was assumed that the site management works are completed prior to construction of the M4-M5 Link project commencing.

Further details on the Rozelle Rail Yards site management works project are available on the Roads and Maritime website[1].

C30.4 F6 Extension

31 submitters raised issues regarding the F6 Extension project.

C30.4.1 Concerns relating to the F6 Extension

Submitters noted that the impacts of the F6 Extension project have not been included in the M4-M5 Link EIS, although some benefits have been included. Submitters considered that the F6 Extension has not been properly assessed.

Submitters were concerned about:

- Impacts on:
  - Homes, including property acquisition and damages
  - Open space, parkland, wetlands, residential neighbourhoods and recreational areas
  - The Royal National Park and the Illawarra
  - The natural heritage along the proposed route
- Motorists not being prepared to pay F6 Extension tolls
- The business case for the F6 Extension is considered to be flawed, not taking into account public transport investment
- The lack of consideration of public transport alternatives to the F6 Extension
- The F6 Extension will cause traffic to exit into local suburbs
- The F6 Extension will not solve congestion issues
- The proposed F6 Extension project is being planned in secrecy.

Response

Specific impacts associated with the construction and operation of the proposed future F6 Extension project are beyond the scope of the M4-M5 Link project. The proposed future F6 Extension project is being developed as a separate project and would be subject to a separate assessment process to meet relevant legislative requirements.

The F6 Extension has been considered as part of the M4-M5 Link EIS only to the extent that it relates to the broader strategic objectives of the WestConnex program of works and in relation to cumulative impacts. The F6 Extension was included in the 2033 cumulative scenario modelled and assessed in the EIS in the following chapters: traffic and transport (refer to section 8.3.4); air quality (refer to section 9.7); and noise and vibration (refer to section 10.4). In addition, cumulative impacts of the M4-M5 Link project and the F6 Extension are summarised in Chapter 26 (Cumulative impacts) of the EIS.

Since the cumulative impact assessment for the M4-M5 Link EIS was undertaken, Roads and Maritime has lodged a Scoping Report for Stage 1 (linking the New M5 at Arncliffe with President Avenue at Kogarah) with DP&E, which is available on the Major Projects website.

[1] http://www.rms.nsw.gov.au/projects/sydney-inner/rozelle-rail-yard-site-management/index.html

Further details on the proposed future F6 Extension project are available on the Roads and Maritime project website[2].

C30.5 King Street Gateway

193 submitters raised issues regarding the proposed King Street Gateway project including:

C30.5.1 Impacts and assessment of the King Street Gateway

Submitters were concerned about the impacts of the King Street Gateway project, specifically why detailed information on the King Street Gateway was not provided in the M4-M5 Link EIS. Submitters were concerned that the King Street Gateway has been excluded from the modelling and cumulative impacts analysis in the EIS, but will alter the road geometry and capacity adjacent to the project.

Response

Specific impacts associated with the construction and operation of the proposed future King Street Gateway project is beyond the scope of the M4-M5 Link project.

The King Street Gateway was considered and excluded from the cumulative impact assessment as described in section 1.2 of Appendix C (Cumulative impact assessment methodology) of the EIS. Key reasons were:

- Design of the project was in the early stages
- Insufficient public information available at the time of the preparation of the EIS
- Impacts and the timing of the project were not yet known.

While investigations into the King Street Gateway project are underway by Roads and Maritime, no confirmed road layout changes or program details were available to inform the technical assessments for the EIS, therefore this project was not included in the operational traffic modelling for the area around the St Peters interchange. The King Street Gateway project would not be precluded by the M4-M5 Link project.

C30.6 Other projects

412 submitters raised issues regarding the other projects:

C30.6.1 Implementation of clearways

Submitters were concerned about the potential impacts of clearways, specifically:

- Objection to introducing clearways to improve travel times. Clearways generate noise and impact small businesses and retail precincts
- When the New M5 project was approved, the community was advised there would be no clearways. This promise has already been broken
- Streets connecting to the WestConnex motorways will become 24 hour clearways.

In particular submitters were concerned with the introduction of clearways on King Street at Newtown. Concerns raised included:

- The NSW Planning assessment decision for the New M5 states that the NSW Government was committed to having no additional clearways on King Street. However, this commitment was not upheld
- Opposition to a 24 hour clearways, including weekends on King Street, Newtown
- Shifting political decisions on King Street clearways: there have been conflicting announcements by Roads and Maritime and the Minister for Roads and the Shadow Minister for Infrastructure about the clearways. These decisions do not seem to be based on an assessment of what the

[2] http://www.rms.nsw.gov.au/projects/sydney-south/f6/index.html

impact of increased traffic flowing from the St Peters interchange will be on King Street and on surrounding roads

- Residents have little trust in Roads and Maritime with respect to upholding promises
- Clearways will have a significant impact on residents, visitors, schools and businesses along King Street, as well as the social and cultural fabric of the community
- Unless WestConnex including Stage 3 is stopped, the thriving precinct of King Street Newtown will be vulnerable to clearways
- SMC does not have authority to establish clearways, but Roads and Maritime does – Roads and Maritime has never said that King Street will not be subject to extended clearways.

Submitters were concerned by the introduction of clearways on Liverpool Road and the Hume Highway at Ashfield, stating that this may result in impacts to local businesses.

Response

There are no plans by Roads and Maritime to change the existing clearways on King Street or to change or implement clearways elsewhere on surface roads as part of the M4-M5 Link project.

C30.6.2 Roads and Maritime construction sites

A submitter raised concerns that while the Work Health and Safety Strategy published online by Roads and Maritime acknowledges the importance of a safe workplace from which workers can go home safely, it does not mention those living in communities adjacent to heavy industrial work sites that operate 24 hours a day, seven days a week. The impacts from these sites are often poorly managed. Submitter raises specific concerns regarding the containment of asbestos contaminated dust.

Response

Several environmental management measures have been developed as part of the M4-M5 Link EIS, in order to minimise risks to the local community. This includes the development and implementation of a Work Health and Safety Plan specifically for construction of the project, which will incorporate asbestos handling and management. A Construction Air Quality Management Plan will also be developed and implemented to monitor and manage potential air quality impacts associated with the construction of the project. See **Chapter E1** (Environmental management measures) for further information.

C30.6.3 Other Roads and Maritime projects (general)

Submitters raised concerns about general impacts due to the following existing or proposed projects:

- Alexandria to Moore Park Connectivity Upgrade (specifically traffic impacts at the Alison Road and Anzac Parade intersection)
- Parramatta Road pinch point project
- Parramatta Road bus rapid transit and future light rail
- Johnsons Creek and Iron Cove Link naturalisation
- Lane Cove Tunnel
- The removal of M4 tolling.

Response

The impacts associated with the construction and operation of other Roads and Maritime projects and the M4-M5 Link have been addressed within the cumulative impact assessment of the EIS, where applicable. Refer to **section C26.4** for further information. The M4-M5 Link does not preclude any proposed projects being assessed separately from the project.

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C31 Out of scope

This chapter addresses issues raised in community submissions associated with issues outside of the scope of the M4-M5 Link Environmental Impact Statement (EIS).

Contents

C31.1 Issues outside the scope of the project

161 submitters raised concerns about issues outside the scope of the M4-M5 Link project.

C31.1.1 Issues unrelated to the project

Submitters were concerned about issues unrelated to the project. Specific concerns included:

- Concern with visual amenity on the Cahill Expressway
- A range of issues in regards to the reduction in petrol vehicle production, the future of electric cars including the installation of charging stations, and the uptake of autonomous cars
- Opal cards should be used in vehicles for tracking, providing benefits for planning and traffic forecasting in real time
- Noise impacts associated with current truck movements and hours of operation from Sydney Ports Corporation/Port Authority of NSW port facilities at Glebe Island using James Craig Road, Anzac Bridge and City West Link bypass under Victoria Road.

Response

The project would not impact on visual amenity associated with the Cahill Expressway.

Electric cars and installation of charging stations

Standalone charging stations are unlikely to be installed in the tunnels as, based on current technology, this would require that the service bays be fitted with point chargers which would need to be manually connected to vehicles. This is not acceptable in the M4-M5 Link tunnels for safety reasons, due to the high potential for vehicle and pedestrian collisions from driver's exiting their vehicles to connect to the charger in a high speed environment, and the extended period of exposure to vehicle emissions whilst charging. The installation of chargers in service bays would also increase the number of vehicles needing to merge in and out of the flowing traffic which would potentially result in slowing down of traffic, resulting in congestion and increasing the risk of collisions. However, the project would not preclude the future installation of charging stations at facilities on the surface road network.

Future developments in induction charging, where vehicles are charged wirelessly during driving, are expected to be possible and it is anticipated that these would be able to be retrofitted into current pavement designs for motorways, and as such could be installed in the tunnels subject to meeting fire safety system requirements.

Autonomous cars

Irrespective of the timing and magnitude of the take up of new technologies such as connected and autonomous vehicles (CAVs), there is still a need to provide for the growth in commercial and freight travel demand and to reduce congestion across the Sydney road network.

The market penetration of CAV's, vehicles with high automation (Society of Automotive Engineers (SAE)) level 4 - drivers are still required to be present) or full automation (SAE level 5 - driverless cars) is expected to take many decades to reach levels high enough to significantly affect traffic and congestion.

Research by IHS Markit (2016) advises that in the Asia Pacific region, the sales of CAV's would account for about 0.6 per cent of new vehicles sold in 2025 and about 4.5 per cent of new vehicles sold in 2036. However, given the time taken for fleet turnover and the time needed for mature regulatory frameworks to be developed, there is likely to be a long period with a mixed fleet of driverless and human driven vehicles.

The UK Department for Transport (DOT UK) report: *Research on impacts of connected and Autonomous vehicles (CAV's) on traffic flow Stage 1: Evidence Review, March 2016* (DOT UK 2016a) examined a range of published research papers to understand the likely impacts of CAV's would have on safety and capacity of road networks. The DOT UK summary of 'the top down' studies it examined concluded:

- In many studies, 100 per cent penetration is assumed to give a 'best case' scenario. Related to this, other studies show little impact on traffic flow and capacity until relatively high penetrations of vehicles with high levels of automation is occurring on road networks
- There is evidence of the potential for demand to rise as capacity increases, or even if just the quality of transport increases
- The way CAV technology is deployed (especially in terms of time gap and the trade-off between comfort, time and safety) by vehicle makers would have a large impact on capacity, and hence policy implications
- Studies are generally confined to self-driving passenger cars, with public transport, freight or alternative ownership models not considered
- There is mixed information and conclusions from earlier studies on capacity, ranging from a potential to reduce it, little change or large increases.

The second stage of the DOT UK report (*Research on the impacts of connected and autonomous vehicles (CAVs) on traffic flow, Stage 2: Traffic Modelling and Analysis Technical Report, May 2016 (DOT UK 2016b)*) sought to understand the impacts of CAV's on capacity through modelling of differing types of road next work with a range of differing proportions of CAV's in the vehicle fleet and for differing road hierarchy including motorways/major highways and also on urban roads.

This second stage of investigation concluded that:

- *'Accounting for user preference, comfort and safety, it is plausible that at least a section of the emerging CAV vehicle fleet is more cautious than that currently operating. This has been represented in the design of CAV scenarios, with early (low penetration) deployments of CAVs including a relatively high proportion of cautious vehicles. This results in a potential worsening of measures of network performance and road capacity especially in high-speed, high-flow situations (such as on the Strategic Road Network (SRN))'*
- *'There is great potential for significant capacity, delay and journey time benefits, particularly in high-speed, high-flow situations. However, there is evidence that at low penetrations, any assertive CAVs are limited by the behaviour of other vehicles; that vehicles are not able to make use of their enhanced capability. This leads to suggestion of a tipping point – the proportion of enhanced vehicles required before benefits are seen. This work suggests this may be between 50% and 75% penetration of CAVs. Results for the SRN (peak period) indicate improvements in delay of only 7% for a 50% penetration of CAVs, increasing to 17% for 75% penetration and as high as 40% for a fully automated vehicle fleet.'*

In summary, research suggests that adoption of CAV's in the Asia Pacific region would remain low for at least two decades. With the opening of the M4-M5 Link due in 2023, CAV's are unlikely to have any impact on capacity at this time. With forecast sales of CAV's representing as little as 4.5 per cent of all new vehicles sold in 2036, it would be at least 25 years before they make up a significant proportion of the vehicle fleet. Even when levels of penetration of CAV's into the vehicle fleet reaches 50 per cent their potential their impact on network capacity is likely to range from slightly negative to slightly positive (seven per cent increase).

Future traffic forecasting

Roads and Maritime Services is the operating agency delivering safe, efficient and quality road networks as part of the transport system. One of the functions of this is traffic monitoring and forecasting across Sydney and NSW to enable appropriate planning and design of the future transport network.

The Opal card is a payment system for use of public transport in NSW. It cannot be used for tracking private motor vehicle usage.

Sydney Port Corporation/Port Authority of NSW operations

Concerns relating to existing Sydney ports operations should be made to the Port Authority of NSW. Contact details are available from the authority's website[1].

In relation to potential future contributions of the project to noise around the White Bay area, associated with the proposed White Bay civil site (C11), please see **section D2.4.2**.

C31.1.2 Traffic and transport

Submitters were concerned about the traffic assessment completed for the project and suggested traffic and transport alternatives and solutions for consideration. Specific issues included:

Road transport

- Incorrect traffic modelling of other projects including, Cross City Tunnel, Lane Cove Tunnel and Brisconnex [the Clem7 Tunnel]
- There should be a policy to ban trucks and commercial vehicles on residential streets. Commercial vehicles should be mandated to use toll roads instead
- Extend a study of road congestion to other roads within Newtown, Ultimo, Glebe, Leichardt, Ashfield and Redfern that are outside the scope of the project
- Concern raised about air pollution from Volkswagens and other car manufacturers who have made false claims regarding emissions. This may affect emissions modelling for road projects
- The tolls on the Cross City Tunnel and the M4 Motorway are too expensive for the average commuter
- The M5 East tunnel, which opened in 1999, proposed a cycleway along Wolli Creek Valley and the East Hills Railway corridor to compensate for there not being any cyclist access in the tunnel; however the cycleway was never built.

Public transport

- Sydney Airport supports the delivery of improved public transport services to and from Sydney Airport, including new bus routes, such as from Miranda, and additional trains on the T2 line
- Elevate train link between Ryde/Epping and Parramatta
- Prefer to invest in fast trains rather than airplanes
- Potential solution for congestion at Military Road at Mosman is an elevated or underground light rail
- Suggestion for a fast train instead of the Western Sydney Airport to access the east coast
- Privatisation of buses will not help in reducing traffic from Parramatta Road at Burwood, Ashfield and Leichhardt to the Sydney CBD
- Establish an environmentally friendly shuttle bus service that would connect with trams every 15 minutes at Leichhardt North light rail stop
- Light rail (utilising the Rozelle Rail Yards rail corridor) can service this region much faster than the Sydney Metro West proposal, which is a long way from approval. If the Metro is approved, it would be complimented by an interchange with the more regional light rail network at White Bay
- Multiple suggestions for other potential rail metro connections in the inner west and North Shore/Northern Beaches
- Suggests options to increase freight rail transport capacity for Sydney to Newcastle and Port Botany to inter-modal terminals using international models
- Rail and metro options within the Newtown, Ultimo, Glebe and Redfern suburbs
- Questions why the only substantial public transport investment is aimed at only the CBD and South East Light Rail project and the Sydney Metro project, when the latter does not really expand rail capacity and the former is becoming one of the most expensive light rail projects in the world

[1] https://www.portauthoritynsw.com.au/

- Plans for the Leichhardt North light rail stop should aim to integrate other nodes of transport and surrounding land uses into its design and improve socioeconomic and ecological outcomes in the area and contribute to regional sustainability
- Statements related to the Sydney Metro design, connectivity and achievable speeds
- A business case for Sydney Metro West should be completed before the determination of the project
- Suggests an elevated rail line over the M5 West corridor as an alternative to Sydney Metro
- A review of potential rail lines eg Epping to Parramatta, West Metro and train lines in the south west
- While the Sydney Metro project will go directly under St Peters station, there is no link between these two rail systems nor is there a metro stop at Alexandria or Erskineville
- The NSW Government is spending many billions of taxpayer dollars on Metro rail in order to relieve a congested City Circle but now it is replicating the City Circle's congested effect with a 60 kilometre road network
- Privatisation of buses would result in the loss of jobs for bus drivers, and therefore result in the reduction in services
- Shanghai and Tokyo have 'excellent public transport rail systems

Active transport

- Active transport and open space options within the Newtown, Ultimo, Glebe and Redfern suburbs.

Response

Road transport

Tolling and traffic modelling completed for the Cross City Tunnel, M4 Motorway, Lane Cove Tunnel and the Clem7 Tunnel are outside the scope of the EIS. The traffic modelling for these projects was completed as part of separate assessment and approval processes.

The implementation of a policy to ban trucks and commercial vehicles on residential streets or mandate that commercial vehicles use toll roads is outside the scope of the project. However, significant reductions in daily heavy vehicle traffic volumes focused on Parramatta Road (east of the M4 East Parramatta Road ramps), City West Link, Victoria Road (east of Iron Cove Bridge), King Georges Road and the existing M5 East Motorway are forecast. There are also reductions forecast along Stanmore Road and Sydenham Road in the inner west. Increases in daily heavy vehicle traffic on surface roads between the St Peters interchange and Sydney Airport are forecast, with reductions in daily heavy vehicle volumes forecast on sections of Princes Highway and Canal Road (refer to Chapter 8 (Traffic and transport) of the EIS).

As discussed in section 6.1.1 of the EIS, the construction strategy would minimise impacts on the local road network by using State, regional and arterial roads, where possible, for heavy vehicle construction traffic and the construction ancillary facilities have been located such that they have direct access onto arterial roads.

The pollution emitted from Volkswagen motor vehicles and the emissions claims made by manufacturers are outside the scope of the project and this EIS. A discussion on emission modelling is included in **section B3.2.3**.

The M5 East tunnels were subject to a separate environmental assessment and approval. The project would have been approved on the basis that it could meet its own conditions of approval. Any proposed cycleways for the M5 East project are considered to be outside the scope of the M4-M5 Link project.

A discussion regarding road options within surrounding areas including Newtown, Ultimo, Glebe, Ashfield, Leichardt and Redfern is outside the scope of this project and any future development works in this area would be subject to a separate assessment and approval.

Public transport

Traffic congestion along Military Road at Mosman is outside the scope of the project.

The privatisation of public transport, improvements to public transport services and new public transport projects (such as additional services, new rail lines, bus routes and stations) are outside the scope of the project and would be subject to a separate environmental assessment and approval. Relevant alternatives to the project are discussed in Chapter 4 (Project development and alternatives) of the EIS.

The Sydney Metro City and Southwest and Sydney Metro West projects (including the design and alternatives) are subject to a separate environmental assessment by Transport for NSW and approval by the Minister of Planning. A *Final Business Case* was completed for the Sydney Metro City and Southwest project by Transport for NSW in 2016 and is considered to be outside the scope of the project.

The costs and benefits of the CBD and South East Light Rail project were assessed in a separate environmental assessment in that project's EIS.

The increase in freight rail transport capacity from Sydney to Newcastle to inter-modal terminals using international models is considered outside the scope of the project.

Active transport

The provision of active transport options within Newtown, Ultimo, Glebe and Redfern as a result of a subway being constructed in these areas is outside the scope of the project.

Strategic alternatives in the scope of the project have been considered in **Chapter C4** (Project development and alternatives).

C31.1.3 Development unrelated to WestConnex

Submitters were concerned about changes to land use and development unrelated to WestConnex such as green corridors. Specific concerns included:

- Build a bridge over the Hawthorne Canal near Blackmore Park so residents of Haberfield can access the light rail stop
- Change the use of Blackmore Park from a recreational oval to an ecological park with a small amphitheatre
- Rezone the underutilised film studio and warehouse near Blackmore Park for redevelopment as medium-density housing with provision for limited mixed commercial and light industrial uses
- Change the land use around the Darley Road site (but not within) including:
  - Rezoning the Orange Grove Public School to allow for a long day care centre
  - Purchase of the bus depot on Balmain Road and relocate it to the Rozelle Rail Yards to rezone the site for community, commercial and residential purposes
  - Rezoning the area bounded by Charles Street and Canal Road to the west to allow for more mixed residential, commercial and cultural uses
  - Development of offices, shops, residences, bus parking and a modest-sized multi sports stadium in the vicinity of the Darley Road site
- Proposed biodiversity corridor between Lane Cove National Park and Royal National Park, extending to Wolli Creek bushland and Sydney Park at St Peters
- High rise development in the inner west is destroying the amenity and heritage character of the community
- Suggestion for development of a biodiversity corridor linking City West Link to the Cooks River and Wolli Creek
- A business case for Sydney Metro West should be completed before determination of the project
- The reduction in surface road traffic as a result of the project should result in benefits to the community including a reduction in the size of City West Link
- Noise impacts following the demolition of a Sydney Ports Corporation shed in 2002 to 2003 which previously acted as a noise barrier to traffic on City West Link
- Changing access arrangement at St Johns School

- Urban design for The Bays Precinct should be prepared and be broadly agreed prior to a revised EIS being prepared
- A higher value use could be had if the Darley Road site, which is situated next to the Leichhardt North light rail stop, was developed for low-rise mixed use transit oriented development, as suggested in a report by Macquarie University in conjunction with Transport for NSW
- Suggested changes to roads:
  - Westbourne Avenue and both Marlborough Street and Bayswater Road should be converted to a two-way and handed back to the local government
  - Traffic accessing Lyons Road via the Victoria Road/Lyons Road intersection could potentially be through slip turning lanes
  - The surface area above the tunnel corridor should be transformed into as well lit, green, pedestrian boulevard (with bus lanes), to make this sector really liveable. This should also connect into a boulevard on Victoria Road, Rozelle.

Response

The rezoning and development suggestions made by submitters are outside the scope of the project. The future use of remaining project land and residual land after construction is discussed in **section C12.8**.

UrbanGrowth NSW is developing proposals for The Bays Precinct. Details can be found in *The Bays Precinct Transformation Plan*, (UrbanGrowth 2015) and at the NSW Government website for the project[2]. Since May 2015, consultation events and opportunities to input into the future development of The Bays Precinct masterplan have been available to the public.

C31.1.4 Air quality impacts from aviation activities

Submitters raised concerns regarding air quality impacts from aviation activities including:

- The deteriorating air quality due to jet fuel in general
- Concerned that residents in the inner west living and working under the flight path are being exposed to aviation fuel, containing organophosphates
- Concerns that pilots, staff and passengers of aircraft are being exposed to high levels of lead
- Concern for chemical trials under flight paths and for air quality due to aviation (lead in aviation fuel)
- Concern for the alleged symptoms of aerotoxic syndrome, caused by breathing air inside the cabin or under the flight path.

Response

Air quality impacts (ground-borne and air-borne) as a result of air travel and jet fuel emissions are outside the scope of the project.

C31.1.5 NSW Government policy and proceedings

Submitters raised concerns regarding NSW Government policy, legislation changes and proceedings. Specific concerns included:

- Issues relating to implementing policy on regulating emissions with demand management methods implying the responsibility for limiting emissions lies with the operator
- Concern the *Protection of the Environment Operations Act 1997* (NSW) (POEO Act) only including emission loads for premises subject to licensing under the POEO Load Based Licensing scheme which means road tunnels are exempt from any emission loads
- The NSW Office of Environment and Heritage (OEH) needs to provide information regarding the 'eight-hour standard' for ozone concentrations, and goals regarding ozone for new motorways
- Objection to the removal of elected councillors within three inner west council districts and appointment of an administrator during critical phases of WestConnex

[2] http://www.thebayssydney.nsw.gov.au/

- The NSW Government are reviewing the policy towards non-filtered outlets. This review should be open and transparent
- The NSW Government to design policies that provide holistic mitigation measures for the wider area, particularly where negative impacts are cumulative and interconnected
- The legislated changes to the EP&A Act were enacted to ensure decisions relating to the project are granted
- Concern that the Planning Assessment Commission is not independent of DP&E
- The NSW Government has a duty of care to keep the community informed about major projects and to act in the best interest of the community
- Concern that the companies who benefit from this project have donated money to NSW political parties
- Request that DP&E staff approach their assessment as planning professionals, and not be pressured by NSW politicians, as there is no legal impediment to this assessment process being a genuine one.

Response

The technical assessments undertaken for the EIS have been based on the Secretary's Environmental Assessment Requirements for the project and the applicable regulatory framework, including relevant legislation and existing NSW Government policies and guidelines. Any future changes to these policies and guidelines are outside the scope of the M4-M5 Link EIS.

The removal of councillors from council districts and appointment of administrators was a decision of the NSW Government and is not relevant to the M4-M5 Link EIS. Consultation with Inner West Council on the project has been ongoing throughout the preparation of the concept design and EIS.

The project, as part of the WestConnex program of works, has been developed in consideration of relevant NSW Government policies and strategies. Further detail on the strategic context for the project is provided in Chapter 3 (Strategic context and project need) of the EIS.

The independence of the Planning Assessment Commission (PAC) is outside of the scope of this project.

Political donations are outside the scope of the EIS for the project.

C31.2 Other

114 submitters raised concerns about various other topics.

C31.2.1 Other issues raised

Submitters raised concerns and suggestions about issues that are outside the scope of the project. Specific issues include:

- Unspecific concerns over Australia's relationship with oil
- Submission suggests a regional biodiversity corridor like the Sydney Green Grid Concept from Royal National Park to Lane Cove National Park and to Ku-ring-gai Chase National Park
- Submission suggests an elevated biodiversity corridor on top of the inner west light rail corridor
- Renovate the Rozelle Hospital to become usable
- Concerned about the dependence on cars of Sydney-siders
- Concern about the shortcomings of the rolling out of the National Broadband Network (NBN)
- The previous Dan Murphy's development application (DA) at the Darley Road site was inadequate
- Concern for asbestos contamination in 2002/03 in relation to the Fox Studios building
- The proposed incinerator at Eastern Creek has some filtration, but the $PM_{2.5}$ air quality issues are not being managed or mitigated

- The increase in traffic on McEvoy Street, Euston Road and Mitchell Road due to developments at the Sydney Technology Park
- Reduced rail services at the Erskineville and St Peters train stations
- The current arrangement of the bypass under Victoria Road amplifies noise impacts.

Response

All of the above issues are outside the scope of the project.

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