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New M5

Submissions and Preferred Infrastructure Report

Main Volume Chapters 5 to 9

Volume 1B

March 2016

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5 Response to community submissions

5.1 General

5.1.1 General – Environment

64 submitters raised concerns about the potential environmental impacts of the project.

Issue description – environmental impacts of the project

Submissions raised general concerns that the project would result in unspecified environmental impacts. Concerns included:

- That the environmental impact of the project has not been taken into consideration
- That the EIS acknowledges that the project would have serious environmental impacts
- That the project would result in environmental degradation
- General concerns about the environmental impacts of the St Peters interchange
- Environmental impacts to residential areas

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.

The EIS included the preparation of a range of detailed technical studies. These technical studies were prepared in accordance with the SEARs and associated material received from key regulatory agencies as well as industry standards and guidelines. Project objectives and how they would be achieved through the project are stated in Section 31.1.2 of the EIS. Impacts from the construction and operation of the New M5 project would be within acceptable limits following the application of management measures as identified in **Chapter 8** (Revised environmental management measures) of this report.

The assessment of potential environmental impacts associated with the St Peters interchange is included in Chapters 9 to 26 of the EIS. Impacts from the construction and operation of the St Peters interchange would be within acceptable limits following the application of management measures as identified in **Chapter 8** (Revised environmental management measures) of this report.

Once completed, the New M5 would significantly increase the capacity of the M5 Motorway corridor, resulting in travel time savings, improving travel reliability and reducing pollution resulting from congestion on the M5 East. Further benefits would be realised through:

- Upgrades to local streets and intersections around the St Peters interchange, ensuring safe and efficient connections to the New M5, and to cater for future growth
- Improved active transport connectivity by providing around 14 kilometres of new and upgraded pedestrian and cycle infrastructure
- A net increase in open space
- Urban design and landscaping enhancements
- Remediation of the Alexandria Landfill site.

WestConnex would provide high quality, motorway standard connections from south western and western Sydney to CBD, Sydney Airport and Port Botany. WestConnex would transform urban travel, providing better connectivity between key employment centres and local communities.

Throughout the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. In response to submissions and as part of further design revisions since exhibition of the EIS, additional work has been undertaken to review the active transport elements of the project to ensure pedestrian and cyclist connectivity and safety are incorporated and are consistent with existing State and local government policies and strategies.

The active transport infrastructure to be implemented as part of the project would improve connectivity for cyclists and pedestrians via provision of a more integrated network. Pedestrian and / or cyclist connectivity outcomes resulting from the project include:

- At the western end of the project, the existing M5 Linear Park shared path would be upgraded to provide a three metre wide surface for the majority of its length (around two kilometres in total)
- Providing a pedestrian and cycle friendly east / west connection to Bourke Road from Campbell Road through an additional crossing of the Alexandra Canal (currently about a 3.5 kilometre gap in connectivity)
- Providing a further connection along Bourke Street near Church Avenue at Mascot, integrating into the Alexandria Canal cycleway and improving north to south connection on separated paths
- Improved connections to bike friendly paths (north of Sydney Park) at Mitchell Road through shared paths along Euston Road and Sydney Park Road at St Peters
- Improved connections from Campbell Road to Simpson Park and Camdenville Park at St Peters with new separated paths
- Improved pedestrian permeability to Sydney Park and the open space created by the New M5. Dedicated footpaths would terminate in either signalised or zebra crossings.
- Provide connection to Canal Road from Sydney Park / Campbell Road through a shared path
- Improved connections into King Street at Newtown from the improvements to the network to the south
- A change to one-way traffic on Barwon Park Road (left turn from Campbell Road) would result in reduced traffic flow increasing the potential cycle use of the road.

The active transport elements being provided as part of the project would also support and facilitate future pedestrian and cyclist connectivity opportunities. These would include:

- Providing opportunities for connection to a possible future extension of the Alexandria Canal cycleway by City of Sydney
- The design of the Alexandra Canal bridge is such that it would not preclude a future connection to a path on the western side of the Alexandria Canal
- The design allows for future connection to active transport infrastructure associated with WestConnex Stage 3
- Allowance for potential connection to Princes Highway from Canal Road or into bike friendly roads in lanes running parallel with Princes Hwy
- The improvements would allow for a future gateway and connector to Alexandria Canal cycleway near Tempe Reserve and further west to Cooks River cycleway (the project is a component of the overall strategic link between the inner west and the Botany Precinct)
- Euston Road improvements and improvements around Barwon Park Road would offer active transport opportunities to future residential developments in the area
- Enables future improvements in the Marrickville area to further integrate the network
- Enables possible future improvement to Barwon Park Road (by reducing road use to one lane and reducing traffic volume).

The upgrades to pedestrian and cycle infrastructure would provide for a safe cyclist and pedestrian environment by minimising the interface between cyclists, pedestrians and vehicular traffic, and would also provide a regional cycle connection, including between Mascot and Marrickville.

5.2 Planning and statutory requirements

5.2.1 Adequacy and independence of EIS

2,795 submitters have raised issues regarding the adequacy and independence of EIS.

Issue description – timing of assessment

Submissions raised concern that some activities including property acquisition, early / preparatory works and the announcement of a preferred design and construct tenderer (including contracts) were carried out before the publication of the Environmental Impact Statement for the project. Submissions argued that this approach has affected the independence and predetermined the outcomes of the statutory assessment and approvals process.

Response

As the approval authority for the project, the Minister for Planning has the discretion under the *Environmental Planning and Assessment Act 1979* (EP&A Act) to refuse or approve the project and to impose such conditions on an approval as the Minister may consider appropriate. In making a decision on the project, the Minister is not bound or constrained in any way by separate activities carried out to date, including property acquisition, early / preparatory works or the design and construct tender process.

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 has included carrying out some preparatory works, including works which have informed the preparation of the EIS, commencing the process of necessary land acquisition and identifying a contractor. These activities would allow timely implementation of the project if it is approved by the Minister for Planning, and would support delivery of the project's benefits as soon as possible. These activities do not undermine the EIS process and it is a matter for the Minister for Planning to determine whether the project should be approved and the conditions of any such approval.

The contractor has been announced to develop the detailed design for the project, and if planning approval is granted, to construct the project. The contractor's design and preliminary construction methodology formed the basis of the preferred design assessed in the EIS. Selection of a tenderer enables a more detailed and accurate representation of the project that would be constructed to be presented in the EIS.

The advancement of the preferred design and appointment of a contractor have therefore provided a robust and accurate description of the project and its construction for assessment and consultation. This provides more certainty as to the design and construction of the project. The project would continue to be refined during detailed design and construction planning. The appointment of a contractor does not undermine the planning and approval process. Construction and operation of the project cannot proceed without approval from the NSW Minister for Planning.

Roads and Maritime recognises and accepts that there is a risk that the decision to be made by the Minister for Planning in the future in relation to the New M5 may not be consistent with parts of the project design proposed by the preferred tenderer and preparatory activities conducted to date. In these cases, the Minister's decision, including any conditions of approval, would prevail and the project design may need to be updated to align with the Minister's decision. These updates would be carried out during the detailed design phase, which is the typical approach for major infrastructure projects of this scale and nature.

All property acquisition for the project is being undertaken in accordance with Roads and Maritime Services land acquisition information guide and the *Land Acquisition (Just Terms Compensation) Act 1991*. Development approval under the EP&A Act is not a prerequisite for this land acquisition process and the project would not commence on any acquired land unless planning approval is obtained.

Issue description – adequacy of the EIS

Submissions raised issues regarding the adequacy of the EIS in providing a detailed, consistent, comprehensive and comprehensible assessment of the environmental, social and economic impacts of the project. It was argued that the EIS focused on economic growth to the detriment of the assessment of environmental and social impacts, while failing to present the project as a clear solution to transport congestion in Sydney. Submissions made the following criticisms of the EIS:

- The infrastructure is over-bearing and under-evaluated
- The EIS has not fully assessed the potential impacts having regard to the scale of the proposed development
- Determination of the project has already been decided
- The stated objectives for WestConnex were contrived to fit the project after it had already been announced
- The EIS should be rejected in its current form and should be prepared by others independent of other WestConnex projects
- Strategic alternatives have not been independently reviewed The project does not follow the 'tests' of good government policy
- The EIS has errors and superficial analyses
- The EIS does not meet a number of the Secretary's Environmental Assessment Requirements (SEARs).

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.

The EIS included the preparation of a range of comprehensive technical studies (contained in Appendices G to V in Volumes 2B to 2H 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, 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. DP&E also commissioned independent technical peer reviews of key technical studies presented in the EIS to inform its assessment of the EIS.

Consultants were engaged to prepare the environmental assessment for the New M5 project via a competitive Request for Tender process. The preparation of the EIS also involved a range of separate consultants outside of the lead EIS consultant including:

- Pacific Environment Limited (Air quality)
- CDM Smith (Groundwater modelling)
- Eco Logical Australia Pty Ltd (Biodiversity assessment report and Biodiversity Offset Strategy)
- Environmental Risk Sciences Pty Ltd (Human health)
- Lyall and Associates (Flooding).

The engagement of specialist consultant to prepare the EIS is consistent with other major transport infrastructure projects of this size and scale.

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

Roads and Maritime is seeking approval for the project under Part 5.1 of the EP&A Act. The approval process under Part 5.1 of the EP&A is illustrated in Figure 2.1 of the EIS. Sydney Motorway Corporation (SMC) is assisting with preparing the planning approval applications and associated documents in respect to the project for Roads and Maritime. As described in Chapter 1 of the EIS, the project is a component of WestConnex. WestConnex was a recommendation of Infrastructure NSW in October 2012, with Government adopting the concept in the *2012 State Infrastructure Strategy* and the *Transport Master Plan*. The first study into options to improve travel times and reliability in the M5 corridor was undertaken in 2009 (Roads and Traffic Authority, 2009).

The size and scale of WestConnex requires the program of work to be delivered in stages. Separate planning applications would be lodged for each individual component project of WestConnex. Each project would be assessed separately, but the impacts of each project would also be considered in the context of the wider WestConnex. The EIS considered other WestConnex projects where relevant and in accordance with industry standards and guidelines.

The project is aligned with NSW Government policy, as discussed in detail in Chapter 3 and Chapter 4 of the EIS, and responses to community submissions regarding this issue are included in **Section 5.3** of this report.

Issue description – transparency of the approval process

Submissions expressed concern that the approval process lacks transparency and accountability. In particular submissions made the following criticisms:

- The involvement of SMC obscures a process which should be openly available to the public
- There is a conflict of interest between the shareholders within SMC, including the NSW Minister for Roads, Maritime and Freight and the NSW Treasurer
- The project is corrupt, having a greater commercial benefit than public benefit.

Response

As outlined in the EIS, the NSW Government has established the Sydney Motorway Corporation (SMC) to deliver WestConnex, ensuring a well-resourced and highly experienced delivery team focused specifically on delivering the project. It is a *Corporations Act 2001* (Cth) entity, meaning that it is a private company that is not guaranteed by the State. SMC is owned by the NSW Government, with the NSW Treasurer and the Minister for Roads, Maritime and Freight, as shareholders and there are external governance and oversight arrangements in place for the project. Further information on these arrangements is discussed in the *WestConnex Updated Strategic Business Case* (NSW Government, 2015) which is available on the WestConnex website at www.westconnex.com.au/documents/updated_strategic_business_case.pdf.

Roads and Maritime remains the NSW Government roads agency, and is the Government client agency for the WestConnex program of works. Roads and Maritime acts on behalf of the NSW Government as the agency commissioning WestConnex.

As a private company, SMC has a Board of Directors which has a duty to act in the best interest of the shareholders (the NSW Treasurer and Minister for Roads, Maritime and Freight). While the SMC Board of Directors provides an immediate level of oversight for the delivery and financing of WestConnex internally and to the responsible shareholder ministers, given the importance and scale of WestConnex and its cross-portfolio implications, it is appropriate for broader cross government oversight. This is facilitated through the WestConnex Interdepartmental Steering Committee (which includes Federal Government representation), regular project monitoring by Infrastructure NSW, and quarterly project reporting to the NSW Cabinet Committee on Infrastructure.

The capital cost of the New M5 component of WestConnex is around $4.3 billion. Whilst the project has a significant capital outlay it would address a number of existing network issues resulting in significant financial benefits to the economy. For example, currently road congestion costs NSW $5.1 billion each year, due largely to transport time delays. This figure is expected to increase to $8.8 billion each year by 2020 (Transport for NSW, 2012).

An assessment of the economic viability of complete WestConnex program of works has been undertaken by KPMG, an independent professional services firm using Cost Benefit Analysis and wider economic impacts analysis. Economic benefits provided as a result of the project include network reliability benefits, vehicle operating cost savings, travel time savings, crash cost savings and others.

The economic analysis undertaken demonstrates that the WestConnex program of works is economically viable and would return $1.71 (2015 dollars) for every dollar invested. This would extend to $1.88 with the inclusion of wider economic benefits.

A sensitivity analysis was undertaken to assess the impact of changes in key assumptions on the conventional cost benefit analysis findings (i.e. excluding Wider Economic Impacts). Key findings of the sensitivity analysis are outlined below:

- WestConnex remains economically viable against all sensitivity tests undertaken, with benefit cost ratios remaining above one in all cases
- WestConnex remains economically viable against potential cost increases of up to 30 per cent to both capital and operating costs, reducing the benefit cost ratio to 1.5 (with Wider Economic Impacts), which is still considered a very positive Benefit Cost Ratio.

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. The project would:

- Reduce traffic on the M5 East Motorway, improving travel times to and from the airport
- Improve traffic flow and intersection performance
- Reduce congestion, resulting in free-flowing traffic conditions and reduced vehicle emissions
- Reduce crash rates
- Improve road safety for pedestrians, cyclists and motorists
- Improve pedestrian and cyclist connectivity in and around St Peters by providing new and improved cycle, pedestrian and shared paths
- Improve the quality of cycle facilities at Kingsgrove
- Improve travel times and reliability for motorists
- Improve transport amenity along the M5 East
- Provide a net gain in new green space for the community
- Facilitate the closure of the Alexandria Landfill.

Issue description – suitability / independence of consultant

Submissions raised concern regarding the suitability of the EIS consultant.

Response

The engagement of the consultants to undertake the environmental assessment of the New M5 project occurred via a competitive request for tender process. Multiple consultants were assessed against the tender evaluation criteria to determine the most suitable candidate to undertake the EIS.

The preparation of the EIS involved a range of separate consultants outside of the lead EIS consultant including:

- Pacific Environment Limited (Air quality)
- CDM Smith (Groundwater modelling)
- Eco Logical Australia Pty Ltd (Biodiversity assessment report and Biodiversity Offset Strategy)
- Environmental Risk Sciences Pty Ltd (Human health)
- Lyall and Associates (Flooding).

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. The authors of the EIS have certified that the information contained within it is neither false nor misleading, as required by the EP&A Act for all EIS documents

Robust and stringent probity controls have been established, including the engagement of independent probity auditors to promote probity with regard to all contracts related to WestConnex.

Issue description – negative impacts of WestConnex program not assessed

Concerns were raised that the EIS selectively considers the benefits of the full WestConnex project without a corresponding consideration of impacts from the full WestConnex program of works.

Response

As described in Chapter 1 of the EIS, the project is a component of the WestConnex program of works. The size and scale of WestConnex requires the program of works to be delivered in stages. Separate planning applications would be lodged for each individual component project of WestConnex. Each project would be assessed separately, but the impacts of each project would also be considered in the context of other WestConnex projects. The EIS considered other WestConnex projects where relevant and in accordance with industry standards and guidelines.

The consideration of proposed projects is standard practice in traffic and transport assessment and is incorporated in the industry standard strategic transport model administered by NSW Roads and Maritime Services (Roads and Maritime). Accordingly, the traffic and transport assessment presented in the EIS considered the alongside other projects within the WestConnex program of works and other upgrades to the broader transport network, particularly in the 2031 future scenario. This approach is also consistent with the SEARs, which require the traffic and transport assessment to consider 'approved and proposed infrastructure projects'.

Other assessments such as the air quality assessment and the noise and vibration assessment similarly considered the impacts from the New M5 and the complete WestConnex program of works in modelling of future scenarios, in accordance with industry standards and guidelines.

Section 27.4 of the EIS also included an overarching assessment of the cumulative impacts of WestConnex component projects across other aspects of the environment, including consideration of social, economic and biodiversity impacts. The cumulative impact assessment found that potential for cumulative impacts with WestConnex and other projects was generally limited. The main areas with potential for cumulative impacts and construction fatigue were with the King Georges Road Interchange Upgrade project and the future M4–M5 Link. However the assessment found that these cumulative impacts would be within acceptable limits following the application of management measures as identified in **Chapter 8** (Revised environmental management measures) of this report.

Issue description – standalone WestConnex New M5 assessment

Concerns were raised that the EIS does not adequately assess the impact of the project if Stage 3 (M4–M5 Link) is not constructed.

Response

The New M5 EIS has been prepared to assess the impact of the project in accordance with the relevant provisions of the 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).

The EIS included the preparation of a range of detailed technical studies. These technical studies were prepared in accordance with the SEARs and associated material received from key referral agencies as well as industry standards and guidelines. Project objectives and how they would be achieved through the project are stated in Section 31.1.2 of the EIS. Impacts from the construction and operation of the New M5 project would be within acceptable limits following the application of management measures as identified in **Chapter 8** (Revised environmental management measures) of this report.

Traffic modelling was undertaken for three scenarios for 2031:

- Without the project
- With only the New M5
- With the full WestConnex program of works, including a future Southern Connector.

This modelling was used as the basis of the EIS, where there was dependency on traffic forecasts to inform various technical specialist studies, including with respect to air quality, human health risks, and noise and vibration. The traffic impact assessment carried out for the project (Chapter 9 and Appendix G of the EIS) identified that additional road network augmentation beyond completion of only the New M5 would be required by around 2031. At this time, traffic forecasting indicates unacceptably low levels of road network performance based on available network capacity (including the extra capacity generated through completion of the New M5) and from continued growth in traffic demand. Should the M4–M5 Link not proceed, traffic forecasts indicate that an equivalent alternative project would be required by around 2031 to avoid unacceptable deterioration in road network performance.

The NSW Government has identified the WestConnex Stage 3 (M4–M5 Link) as the project to provide additional road network capacity and an application for approval of the M4–M5 Link has been lodged with the Department of Planning and Environment. An EIS for the M4–M5 Link would be prepared and publicly exhibited for comment in the future.

5.2.2 Approval process

273 submitters have raised issues regarding the approval process for the project.

Issue description – staged approval

Concerns were raised regarding the decision to progress the WestConnex program of works through the planning system in stages. This decision was seen as disingenuous, as the staged approach was perceived to avoid the assessment of the full extent of impacts of WestConnex. Additionally it was stated that the project cannot work without the other tollways (M4–M5 link, Southern Connector, Sydney Gateway), therefore the EIS should assess all impacts of all tollways and seek approval at the same time.

Response

As described in Chapter 1 of the EIS, the New M5 project is a component of WestConnex. The size and scale of WestConnex requires the program of work to be delivered in stages.

Separate planning applications would be lodged for each individual component project of WestConnex. Each project would be assessed separately, but the impacts of each project would also be considered in the context of the wider WestConnex. The EIS considered other WestConnex projects where relevant and in accordance with industry standards and guidelines.

Chapter 27 of the EIS assesses potential cumulative impacts associated with the construction and operation of all components of the WestConnex program of works, based on information about the component projects that was publicly available at the time the EIS was prepared. Impacts associated with only the New M5 excluding future components of the full WestConnex program of works (M4-M5 link, Southern Connector and Sydney Gateway) were also identified and discussed in the EIS.

5.2.3 Statutory requirements and other approvals

14 submitters raised issues regarding statutory requirements and other approvals.

Issue description – groundwater discharge from landfill

Submissions expressed concern that Roads and Maritime does not hold an environment protection licence for the discharge of water to the environment and has been acting illegally when discharging extracted Botany Sands groundwater into the stormwater system, since acquiring ownership of the landfill.

Response

In accordance with Schedule 1 of the POEO Act, an environment protection licence (EPL) would be sought for construction if planning approval is granted.

Issue description – local planning instruments

Submissions argued that the project was in conflict with the relevant local environmental plans administered by the local councils. Further submissions raised concerns that the project did not align with local government objectives.

Response

In accordance with section 115ZF of the EP&A Act, environmental planning instruments, including local environmental plans (LEPs), do not apply in respect to State significant infrastructure projects. The project is located within six local government areas (LGAs): Canterbury, Hurstville, Rockdale, Marrickville, Sydney and Botany Bay. Above ground works are proposed to be located within each of these LGAs. The project would also be located on land identified under the *Sydney Regional Environmental Plan No. 33 – Cooks Cove* (Cooks Cove SREP) in Arncliffe.

Land use zones under each of the following LEPs, where works are proposed to be located, were discussed in Chapter 13 of the EIS:

- Hurstville Local Environmental Plan 2012 (Hurstville LEP)
- Canterbury Local Environmental Plan 2012 (Canterbury LEP)
- Rockdale Local Environmental Plan 2011 (Rockdale LEP)
- Botany Bay Local Environmental Plan 2013 (Botany Bay LEP)
- Marrickville Local Environmental Plan 2011 (Marrickville LEP)
- Sydney Local Environmental Plan 2012 (Sydney LEP).

Issue description – Sydney Development Control Plan 2012

Submissions raised concern that traffic resulting from the project along Euston Road is in breach of the *Sydney Development Control Plan 2012* Section 4.2.5.3. The point states that where a development fronts roads with more that 40,000 vehicles per day, non-residential uses are required on the ground floor and first floor.

Response

Under the EP&A Act, development control plans (DCPs) do not apply in respect to State significant infrastructure projects.

Development controls plans provide detailed planning and design guidelines to support the planning controls in local environmental plans. The project is located within six local government areas (LGAs): Canterbury, Hurstville, Rockdale, Marrickville, Sydney and Botany Bay. Local environmental plans associated with these local government areas, in addition, do not apply in respect to State significant infrastructure projects.

5.2.4 Exhibition timing and duration

405 submitters raised issues regarding exhibition timing and duration.

Issue description – timing and duration

Concerns were raised that the 64 day public exhibition period 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 90 day exhibition period.

As such, submissions:

- Requested an extension of EIS public exhibition period

- Stated that the planning process was difficult for the community (due to size, complexity and timeframes of the EIS)
- Stated that alternative sources of information (such as voluntary action groups) were relied upon to understand the project issues.

A submitter also raised concerns that the EIS was not exhibited in Enmore or Newtown.

Response

Under the EP&A Act, the Secretary of the Department of Planning and Environment 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 statutory minimum of 30 days to a total of 64 days (27 November 2015 to 29 January 2016) to account for the Christmas and New Year period.

The public exhibition period for the New M5 EIS is more than double the statutory minimum and longer than that for other recent comparable transport infrastructure projects, including NorthConnex (60 days) and the WestConnex M4 East (55 days). As described in **Chapter 2** (Community involvement) of this report, consultation activities continued during the EIS exhibition period, including community information sessions and stakeholder meetings. If the project is approved, future consultation would be undertaken with regard to construction activities and the management of impacts.

Section 7.6.2 of the EIS identifies the locations that the EIS was exhibited and included:

- Newtown Library, 8 - 10 Brown St, Newtown
- Natural Conservation Council of NSW, Level 2, 5 Wilson Street, Newtown.

Electronic copies of the EIS are also available online for viewing on the DP&E and WestConnex websites.

5.2.5 Procurement

Nine submitters raised issues regarding procurement

Issue description – procurement

Submissions raised concerns regarding the suitability of the contractor.

Response

The broad NSW Government tendering process was explained in Chapter 4 of the EIS. As outlined in Section 4.1.4 of the EIS, a competitive tender process to design and construct the New M5 has been followed. The tender process commenced in September 2014 when invitation was issued seeking expressions of interest from companies to design and construct the New M5.

Tenders from shortlisted contractors to build the New M5 were received in March 2015. The evaluation of tenders included consideration of engineering design, environmental and social performance, and project cost (including upfront capital expenditure and ongoing operational expenditure). Relevant technical specialists were involved in the tender evaluation.

The evaluation of engineering design requirements involved an assessment of the tender designs against a set of mandatory functional requirements, the performance of the engineering aspects of the designs and the identification of risks within each design. This involved separate assessments for each engineering aspect such as road geometry, drainage, structural elements and ventilation systems.

The evaluation of environmental and social performance included a risk-based evaluation of the performance of each tender design against applicable environmental and land use criteria, during construction and operation of the project. An assessment of each tender design against environmental legislative requirements was also conducted.

The preferred tender design was chosen based on the outcome of the above evaluation of the three tender submissions. This process provided a balanced consideration of engineering design

requirements, project cost (including upfront capital expenditure and ongoing operational expenditure), and environmental and social factors.

The evaluation of tenders took place until the announcement of the preferred tenderer, a consortium comprising Leighton (now CPB), Dragados and Samsung C&T, was made in September 2015.

5.3 Strategic justification and project need

5.3.1 Justification and need for the project

3,875 submitters raised issues regarding justification and need for the project.

Issue description – project would not meet stated objectives

Submissions raised concerns regarding the need for the project on the basis that the project would not meet its objectives. Submissions raised the following issues:

The project would not meet its objectives:

- The project as proposed in the EIS does not deliver the broader objectives of WestConnex as stated in the Updated Strategic Business Case (November 2015)
- The project does not fulfil the objective 'Provide for integration with other WestConnex projects and the proposed Southern Connector (formerly Southern extension), while not significantly impacting on the surrounding environment in the interim period
- The stated objectives for the project were contrived to fit the project after it had already been announced. Project objectives can't be measured
- The project would create more problems (environmental and social) and would only create minor improvement in travel times. Even with construction of the full project, travel times in St Peters would only improve by as little as 30 seconds while, in other areas, traffic on suburban streets would increase by around 50 per cent
- The project does not enhance the productivity of commercial and freight generating land uses strategically located near transport infrastructure
- The vehicle speed increases predicted (18.9 kilometres per hour to 26.9 kilometres per hour for the AM peak and 16.3 kilometres per hour to 28.3 kilometres per hour for the PM peak) seem insufficient to justify the project
- A claimed benefit of the project is that daily traffic on the existing M5 East Motorway would reduce by 20-40 per cent due to the new tolls. If it is acknowledged that tolls alone can be effective in meeting the main project objective (reducing congestion), then what is the rationale for adding more capacity?
- Introducing the toll on the M5 East Motorway would substantially reduce demand for the M5 East Motorway tunnels. The extent to which this improves traffic in the M5 East Motorway has not been discussed in the EIS. Any benefits of the New M5 stated in the EIS need to factor in both of these issues. To demonstrate the benefits of building the New M5 tunnels the EIS needs to show what the outcomes would be if WestConnex is built without the New M5 tunnels

Submissions asserted that the project would not meet its objectives in relation to solving traffic problems, including congestion and would not improve traffic flow. Specific issues included the following:

- Traffic may continue to increase by up to 25 per cent on the M5 East Motorway, as the preferred route to Sydney Airport, Port Botany and the Sydney CBD. By 2021, more than 31,000 vehicles a day would use the St Peters interchange and this could exceed 55,000 vehicles by 2041
- Adding extra traffic from the New M5 on to Maddox Street would cause more congestion
- The St Peters interchange would have a negative impact on the inner west, while not solving congestion issues
- Several intersections across the project route would remain at Level of Service F (the worst) with the project

- Sections of the road network would operate at level of service D, E or F immediately upon completion, and Roads and Maritime would have to have a program of works to address the situation straight away. This suggests that the New M5 and the wider WestConnex program of works is an obsolete road and transport solution
- The EIS ignores the work of independent traffic and planning experts who have presented evidence based arguments that WestConnex would not meet its projected time savings or congestion relief targets
- The project would not improve access to city centre jobs – 90 per cent of western Sydney workers commute to the city on public transport
- Level of Service would improve at many intersections even if nothing is done – in the case of the Euston Road / Sydney Park Road intersection, from D to A in the PM peak
- Experience globally tells us that urban road projects usually move the bottlenecks to different places in the network, cancelling out the initial time savings
- Traffic would clog the city
- The proposed St Peters interchange and exit spur along Euston Road would not deliver traffic solutions
- Traffic volumes would increase on Edgware Road and surrounding streets up to 2032
- The effect of the project on local roads (increased congestion, due to toll avoidance) would result in the project failing to meet its objectives due to increased congestion, as the surrounding existing road network can only accommodate 80 per cent of the traffic it generates. Even with road widening, the local area cannot handle this amount of cars
- The project would direct vehicles onto roads which don't lead to a destination that people would actually need (e.g. Euston Road and Campbell Road)
- The project does not meet its objectives in relation to connecting Western Sydney with Sydney Airport and Botany Port:
- It does not offer faster transportation to Mascot airport from the western suburbs and even the projected travel times using WestConnex are longer than the travel times using the existing rail infrastructure
- The new Sydney Airport in not considered in the EIS as a major centre in the Sydney Metropolitan area
- The alignment of the New M5 does not deliver on the fastest and most direct path to Smith Airport and Port Botany. The route veers away from the airport and port to terminate at the St Peters interchange, and the future route of the connection to these two facilities would require vehicle movements to flow in the opposite direction to their destinations all the while immediately depositing thousands of vehicles into the suburbs of Newtown, Alexandria, Green Square, and Erskineville.

Response

Meeting the project's strategic objectives

The WestConnex program of works involves the construction and operation of a 'missing link' in Sydney's motorway network, as part of a broader program of projects and initiatives to deliver a modern, integrated transport system for Sydney. This broader program of projects and initiatives is detailed in the *NSW Long Term Transport Master Plan* (Transport for NSW, December 2012).

As discussed in Chapter 3 of the EIS objectives have been developed for the project 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 project, which have been developed to be aligned with the strategic objectives of national and NSW planning and policy documents. **Table 5-1** in this report provides a summary of how the project would meet these objectives.

The objectives of WestConnex were first outlined in *WestConnex – Sydney's next motorway priority* (Infrastructure NSW, 2012b). These objectives were developed following consideration of current and

anticipated future challenges faced by road users, businesses and the community that live and work in Sydney.

Solving traffic problems along the M5 Motorway corridor

The existing M5 East Motorway is heavily congested for large parts of the day. It carries over 100,000 vehicles per day, including about 10,000 heavy vehicles; well in excess of its design capacity. The M5 East Motorway currently experiences heavy traffic congestion, slow speeds and unreliable travel times especially in the morning and afternoon peaks, and increasingly at other times of the day and on weekends. Sydney's population is expected to increase by more than 1.6 million people by 2031 and without major investment in road network infrastructure this growth would result in worsening road congestion. This congestion would in turn affect Sydney's economic competitiveness as a global city.

The New M5 project would:

- Provide additional motorway capacity along the main connection to Sydney Airport, Port Botany and south-west 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.

Without the project, traffic volumes on key local roads around St Peters are generally expected to increase due to projected population growth in the region. Intersection performance along local roads around the St Peters interchange would also deteriorate as a result of the associated traffic growth.

Without the local road upgrades and the New M5 project, this forecast growth in traffic would cause further congestion, with the network unable to accommodate the expected demand. By 2031, motorists travelling in the PM peak would experience significant congestion compared to today. This is forecast to result in a 67 per cent increase in travel times, a 40 per cent decrease in speeds and increasing delays at some intersections.

Local streets and intersections around St Peters interchange would be upgraded to ensure safe and efficient connections for the New M5 and would provide the necessary additional capacity to cater for future traffic growth. Substantial new capacity would be created along Campbell Street and Euston Road, directing through traffic along these routes and away from residential properties.

By 2031, under the 'full WestConnex and future Southern Connector' scenario, the average travel time per vehicle through the modelled road network would reduce by about 11 per cent and average speed would increase by around 42 per cent in the AM peak. In the PM peak hour, further significant improvements are forecast, with the average travel time per vehicle reducing by 26 per cent and average speed per vehicle increasing by 74 per cent, when compared to the 'without project' scenario.

The project would also deliver around 14 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.

During the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. Following exhibition of the EIS and in response to submissions, additional work has been undertaken to build on the work completed to date, and to ensure pedestrian and cyclist facilities are consistent with existing State and local government policies and strategies.

New active transport infrastructure in the St Peters, Mascot and Alexandria precincts would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure.

Section 5.8.10 and **Section 5.8.19** of this report, along with Chapter 9 and the Technical working paper: Traffic and transport (Appendix G) of the EIS, provide a detailed description of the traffic and transport, and active transport aspects of the project.

As described in Section 4.1.1.6 of the Technical working paper: Traffic and transport (Appendix G of the EIS) the operational 'without project' or 'do minimum' scenario assume that the King Georges Road Interchange Upgrade and the M4 Widening are complete, but the remainder of the WestConnex projects are not built. It is called the 'do minimum' or 'without project' scenario rather than 'do nothing' scenario as it assumes that ongoing improvements would be made to the broader transport network including some new infrastructure and intersection improvements to improve capacity and cater for traffic growth. The incorporation of these ongoing improvements into the 'without project' or 'do minimum' scenarios results in the level of service at some intersections improving, and deteriorating at others.

The EIS acknowledges that other WestConnex projects including the M4-M5 Link are needed to deliver a number of project benefits. However, Section 1.4 of the EIS also identifies the project benefits that would be delivered by the project alone and in combination with the King Georges Road Interchange Upgrade, which is currently under construction.

The New M5 project would:

- Provide additional motorway capacity along the main connection to Sydney Airport, Port Botany and south-west 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.

Together with the Southern Connector, the project would:

- Support the economic development of Sydney by providing a high quality and efficient road connection for motorists and freight vehicles between the Global Economic Corridor and Global Sydney (as defined in *A Plan for Growing Sydney* (NSW Government 2014))
- Provide additional capacity to address existing traffic congestion on the M5 East Motorway and local roads by separating longer distance through traffic from local traffic. Current traffic congestion is causing poor amenity along the M5 Motorway corridor and constraining the operation of existing businesses and efficient movement of freight
- Provide better connectivity between local centres adjacent along the M5 East Motorway corridor
- Facilitate urban renewal in precincts adjoining the M5 East Motorway corridor by improving local amenity with less traffic noise and vehicle emissions from congested traffic.

The project would support NSW's key economic generators (including Sydney Airport and Port Botany) and provide a strategic response to the currently inadequate, and highly congested, road network. Critically, this includes a targeted response to current failures in the motorway network, through provision of operational benefits in relieving congestion along the M5 East Motorway, including a reduction in travel times and improvements in road safety. The investment in the project and other WestConnex stages would facilitate a step change in network performance, supporting Sydney's global economic corridor and western Sydney, both of which are important to the economic development of NSW and Australia.

Improvements to the transport network, including the project, would support the global economic corridor and western Sydney by enabling domestic and international freight and trade, encouraging business and industry investment and, as a result, employment opportunities, in south west centres. The project would also contribute to improved profitability for commercial and freight businesses through reduced transport costs, in terms of money and time lost to congestion and fuel consumption. It may also contribute to the desirability of services that rely on transport along the corridor. The project would therefore underpin a sustainable NSW economy and Sydney's role as a global city.

Integrated land use and transport planning initiatives are a key factor in developing a future in which Sydney's growing population can reliably access jobs and services. The project complements a number of other transport and freight-based infrastructure initiatives identified in the Transport Master Plan, a combination of which would best address Sydney's needs.

Chapter 3 of the EIS for the New M5 provides detailed information about the need for the WestConnex program of works, and the New M5 as a component of those works. The strategic importance of WestConnex as just one part of a broad suite of transport infrastructure projects, including public transport measures, is also detailed in that chapter. Importantly, the EIS outlines the Government's plan to pursue this suite of transport infrastructure projects to tackle current and future congestion issues, recognising that no single project in isolation would provide a complete solution.

Chapter 4 of the EIS outlines the development of the project, and alternatives to the New M5 that have been considered. Alternatives to the New M5, including optimising existing infrastructure, demand management, additional public transport and the 'do nothing' option are assessed in the chapter against the key project objectives. This assessment demonstrates that the New M5 provides the best complete response to the project objectives, relative to alternatives, and within the broad suite of transport infrastructure projects proposed to address congestion across Sydney.

Improving connections to Sydney Airport and Port Botany

The New M5 would provide commuters from south western Sydney with direct connectivity to the employment zones to the north and west of the Sydney Airport / Port Botany precinct, and access to Sydney Airport via upgraded local roads in the short term, as well as future connectivity to the future Sydney Gateway. The New M5 would also allow redistribution of vehicles from the existing M5 East Motorway, particularly those commuters connecting to the CBD and the inner west of Sydney, rather than proceeding through the port / airport precinct. This redistribution of traffic aligned with commuter destinations would contribute to easing congestion along the M5 East Motorway. By easing congestion along the M5 East Motorway, the New M5 would enhance connectivity for commuters using the M5 East Motorway to access employment centres along the M5 corridor, including the port / airport precinct.

The *State Infrastructure Strategy* (Infrastructure NSW, 2012) states 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. This is the consequence of established land use patterns in Sydney, including in western and south western Sydney, and there is no indication in the available data that the patterns of demand would change in the future.

Table 5-1 Assessment of the project against the project objectives

Project objective	Comment
Support Sydney's long-term economic growth through improved motorway access and connections linking Sydney's international gateways and Western Sydney and places of business across the city.	The New M5 would improve the capacity of the NSW motorway network, particularly along the M5 Motorway corridor, 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 transport efficiency within the project corridor by: • Improving the existing motorway capacity to reduce congestion and increase travel efficiency • Adding a motorway connection point immediately west of Sydney Airport, supplementing the existing motorway connection to the M5 East Motorway, east of Sydney Airport • Providing a future motorway connection point for the future M4-M5 Link • Safeguarding a connection to a potential future Southern Connector.
Relieve road congestion so as to improve the speed, reliability and safety of travel in the M4 and M5 Motorway corridor, including parallel arterial roads.	The project would reduce vehicle numbers and travel times along the M5 Motorway corridor, which would improve speed, journey reliability and safety in this corridor. The project would also provide additional route options along the corridor and therefore increase network resilience in the event of incidents, especially in the M5 East Motorway tunnels. Some improvement along parallel arterial roads is forecast, with some increases in volumes along other parallel routes.
Cater for the diverse travel demands along these corridors that are best met by road infrastructure.	The key users who would benefit from the project include: • Highly dispersed and long distance passenger movements • Heavy and light freight and commercial services • Businesses whose travel patterns are highly dispersed and diverse. The transport demands of these users are best served by an efficient motorway connection. The project would meet this project objective by relieving congestion within the project corridor and facilitating efficient passenger and freight movements through Sydney.
Enhance the productivity of commercial and freight generating land uses strategically located near transport infrastructure.	Commercial and freight generating land uses are located around Sydney Airport and Port Botany, in south west Sydney and along the project corridor at Kingsgrove and St Peters. By providing a more efficient motorway between commercial and freight hubs, the project would enhance the commercial and freight generating land uses located within the Port Botany precinct, along the project corridor and towards south west Sydney. The productivity of these land uses, particularly those relying on transport of materials and freight, is currently impeded by congestion. By providing additional capacity along the corridor, the project would improve transport efficiency, reducing costs to businesses. The project would also contribute to improved profitability for commercial and freight businesses through reduced transport costs, in terms of money and time lost to congestion and fuel consumption. It may also contribute to the desirability of services that rely on transport along the corridor.

Project objective	Comment
Fit within the financial capacity of the State and Federal Governments, in partnership with the private sector.	The project has been subject to a competitive tendering process and would fit within the financial capacity of the State and Federal Governments. The project would be funded by the NSW and Federal Governments. The government contributions would be supplemented by finance from the private sector, and a user-pays system, which would be introduced when the project opens.
Optimise user pays contributions to support funding in an affordable and equitable way.	The project would consist of a tolled motorway to facilitate user pays contributions and reduce the overall cost burden on the wider community in NSW. Inclusion of a toll makes construction of the project affordable and equitable.
Provide for integration with other WestConnex projects while not significantly impacting on the surrounding environment in the interim period.	The project has been designed to allow integration with other WestConnex projects, and would include stub tunnel for connection with the future Southern Connector and the future M4–M5 Link. The project also includes upgrades to local roads around the St Peters interchange to provide a safe and efficient connection between the New M5 and the surrounding surface road network. The project has been designed to minimise the project footprint and maximise the use of land already reserved for road infrastructure. Further, the project would involve the closure and rehabilitation of the Alexandria Landfill site, for use as the St Peters interchange. This approach allows for integration with the future M4-M5 Link at St Peters, while realising an end land use for the Alexandria landfill that is beneficial to the wider community.
Protect natural and cultural resources and enhance the environment.	The design of the project has avoided or minimised potential environmental impacts. For example, the design has: avoided high value ecological areas such as the Wolli Creek Regional Valley, and minimised impacts to Cooks River Castlereagh Ironbark Forest Critically Endangered Ecological Community and the Green and Golden Bell Frogs key population of the lower Cooks River. Where potential adverse impacts were not able to be completely avoided through design, additional mitigation and management measures have been identified. The measures identified to minimise potential impacts were summarised in Chapter 30 of the EIS (as revised in **Chapter 8** (Revised environmental management measures) of this report). The proposed mitigation measures would minimise adverse social and environmental impacts in the local area during construction and operation of the project as far as feasible and reasonable. 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 and a long term reduction in greenhouse gas emissions • Effecting the closure and remediation of the Alexandria Landfill, which would improve the environment at this location, addressing impacts of this contaminated land and allowing for a more beneficial end use of this site • Enhancing cycling and pedestrian infrastructure around the St Peters interchange, providing greater connectivity for cyclist and pedestrian journeys.

Issue description – induced demand

Submissions 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), and is likely to have been underestimated
- There is no evidence that increasing road capacity and building urban motorways can relieve road congestion in the long term, because the added capacity simply induces more demand
- How long would it be before WestConnex is at capacity?
- The government has done much in the way of improving public transport, but the time and expense involved in road and rail projects ensures they would always be slower than the demand
- The project would encourage people to use private vehicles.

Response

The term 'induced demand' covers changes in travel patterns arising from transport infrastructure investment, which can occur both for road and public transport investment, including:

- Completely new travel that was not occurring before as a result of new/improved infrastructure
- People changing their trip making patterns, for example visiting alternative shopping or leisure destinations that are made more accessible by the new/ improved infrastructure
- People changing mode (e.g. shifting between car and public transport use)
- People changing the time that they make their trips (e.g. leaving later to get to work as a result of improved infrastructure).

In the long run, individuals and firms would make decisions about locating closer to destinations more accessible via transport infrastructure.

The Updated WestConnex Strategic Business Case acknowledges that the construction of new roads can induce more people to travel on the road network. This is predicted to increase the 2031 future year traffic volumes using WestConnex by between two per cent and seven per cent. The predicted induced travel demand was incorporated into the WestConnex Road Traffic Model (see Section 9.1.4 of the EIS).

The combined number of new road trips and trips redeployed from public transport as a result of the full WestConnex program of works is anticipated to be around 0.4 per cent of the total number of daily car trips on the WRTM Sydney-wide network in 2031.

The New M5 tunnels would be marked for two traffic lanes upon opening, but would have capacity to mark additional lanes if required in the future. The New M5, and the WestConnex program of works, have been designed to have sufficient capacity to accommodate anticipated traffic volumes over the life of that infrastructure.

The WestConnex program of works and other major transport infrastructure projects planned across Sydney are in part a response to an extended period of lower investment in transport infrastructure by successive governments. The current NSW Government has made a commitment to deliver a modern, efficient and integrated transport Sydney, as detailed in the *NSW Long Term Transport Master Plan* (Transport for NSW, 2012).

Issue description – temporary solution only due to outside factors

Submissions raised concerns that the project would only provide a temporary solution due to various external reasons and that these factors have not been considered in the EIS and business case. Submissions queried that the New M5 project had only been assessed to 2031, which does not take into account the 45 year concession period for the asset as stated in the Updated Strategic Business Case. The EIS and the business case do not consider a change in travel demands and behaviours due to:

- Decreasing global supply of fuel which would limit use of the New M5 to 15 to 20 years - the public expectation is that WestConnex would return 80 to 100 years of use
- Increasing online communication (through the NBN) reducing the need to commute
- 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
- Electric vehicles (EVs) replacing internal combustion engine cars (ICEs) and driverless cars
- The rise of rideshare services such as Uber
- Young people buying fewer cars
- The increased preference for high density living close to places of work
- The sharing economy
- Workers electing to work closer to home or use public transport, bicycles or car sharing
- Climate changes that would render massive tunnels and overpasses dangerous in the extreme.

Submissions also noted the following external factors which may limit the benefits and longevity of the WestConnex project:

- The project does not consider the possibility of a 'no growth' economy
- Anticipated population increases and associated increases in private road transport would see slower traffic times in the future
- Does not consider population distribution
- Future of Sydney's capacity would be geometrically limited, which would limit transport demand. The project is a temporary solution
- Driver licencing has not been considered.

Response

In preparing the *NSW Long Term Transport Master Plan* (Transport for NSW, December 2012), 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. As part of that work, the need to complete Sydney's motorway network, including completion of the M4 Motorway, provision of additional capacity along the M5 Motorway corridor and connection of the M4 Motorway and M5 Motorway was identified. This need forms the basis of the WestConnex program of works.

Within the context of the *NSW Long Term Transport Master Plan*, it is acknowledged that a motorway solution would be required. This motorway solution is provided in the form of the WestConnex program of works, including the New M5 project. Provision of a motorway solution does not alter the Government's commitment to deliver the other, non-motorway projects detailed in the *NSW Long Term Transport Master Plan*.

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 rise of the sharing economy including ride-sharing services such as Uber and improvements to technology. These initiatives are supported by the directions established in *A Plan for Growing Sydney* - released in December 2014 – which sets out the NSW Government's policy for how Sydney would grow over the next 20 years.

However, as Sydney's population grows, so too does the demand for travel on the road network by bus, car, or motorbike. The number of car trips is expected to increase substantially given the growing population of Sydney overall, even in the context of significant public and active transport investment, and structural changes to the way people live, work and move about in Sydney. As such, the road network would continue to accommodate the vast majority of journeys in Sydney for the foreseeable future.

The local road upgrades around the St Peters interchange would facilitate additional capacity in the road network, providing improved connections to areas of Sydney undergoing urban redevelopment. Without these upgrades, the predicted increase in traffic volumes around the St Peters area would act as a handbrake on the capacity of the road network to efficiently accommodate local trips, eroding the attractiveness of this area for future investment in regeneration projects. Through the provision of efficient and safe connections to the New M5, and the broader WestConnex when the M4-M5 Link is completed, as well as improved vehicular pedestrian and cyclist connectivity between local centres, the local road upgrades would support ongoing investment in the revitalisation of strategically important locations close to the Sydney CBD.

The New M5 and WestConnex have been identified as part of an integrated transport solution for the current transport planning timeframe, as detailed in the *NSW Long Term Transport Master Plan* (Transport for NSW, 2012). As detailed in the EIS, between 2021 (nominal year of opening) and 2031 (10 years after the nominal year of opening), average travel times on the M5 East Motorway would generally be halved and average travel speeds would double during the morning and afternoon peaks, improving the efficiencies of commuter and intrastate and interstate freight movements through travel time savings and reduced operating costs.

Together with the Sydney Gateway, the project would support the economic development of Sydney by providing a high quality and efficient road connection for business and freight vehicles between the 'Global Economic Corridor' including Port Botany and Sydney Airport to Global Sydney. This connectivity is identified in the priority actions to achieve the goals set in *A Plan for Growing Sydney.*

Climate change adaptation and resilience

The NSW Government has acknowledged that, despite efforts to reduce greenhouse gas emissions, some climate change is now inevitable. The Government aims to minimise the impacts of climate change on natural and built environments, communities and the economy.

Road networks and infrastructure assets are exposed and vulnerable to climate change because of their long design life, during which many impacts of climate change may become more significant.

Roads and Maritime determined that the assessment of the potential impact of climate change on the project is warranted due to the significant investment required for the project, the long design life of the project, and its exposure to potential flooding impacts.

During detailed design, a detailed climate change risk assessment would be undertaken in accordance with relevant standards and guidelines, including Australian Standard 5334-2013 *Climate change adaptation for settlements and infrastructure - A risk based approach*. AS 5334-2013 includes processes for communication and consultation with stakeholders, as well as monitoring and review to ensure the implementation of appropriate adaptation strategies.

Adaptation measures, including those to mitigate microclimate effects, would be further considered and refined during this detailed climate change risk assessment. The influence of tidal waterways on the project was considered in the climate change risk assessment undertaken for the EIS. The adaptation options put forward in the EIS included the incorporation of projected sea level rise into hydrological / hydraulic modelling undertaken during detailed design to ensure the project would not lead to unacceptable flood risks.

Issue description – project discourages investment in and use of public transport

Submissions raised concerns that the project would increase dependency on cars and discourage the use of public transport and investment in public transport infrastructure. In particular submissions raised the following issues regarding the project:

- Discourages investment in public transport. A lack of investment in public transport may cause people who are unable to drive to lose independence
- People prefer to travel via public transport
- Project is inconsistent with the overall public transport strategy
- There may be possible impediments to future improvements in public transport if the operators of the tolled M5 are given non-competition clauses in their contracts.

Response

Public transport options would be feasible alternatives to the project should the objectives of the WestConnex program of works be largely concerned with transporting people to and from centres. However, the commuting demand is only a proportion of the demand along the M5 East Motorway corridor. 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.

While 70 per cent of commuters travel by car, commuters only make up around 20 per cent of trips across an average working day (Bureau of Transport Statistics, 2014a). 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, 2013d)
- 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, 2013d).

In 2012/13, buses comprised six per cent of the mode share for trips on an average weekday. This was a proportional increase of 0.5 per cent from 2002/03, which equated to around 165,000 additional trips on average per weekday. Buses rely on the public road network to be able to transport commuters to a diverse array of destinations (Bureau of Transport Statistics, 2014a).

In assessing the need for new road infrastructure, the 2012 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 infrastructure strategy 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 Government is making substantial investment in strategically important roads and public transport, including Sydney Metro City and Southwest, Southwest and CBD and South East Light Rail, enhancements to the suburban rail network, and upgrades to cyclist and pedestrian facilities.

Together with the Sydney Gateway, the project would support the economic development of Sydney by providing a high quality and efficient road connection for business and freight vehicles between the 'Global Economic Corridor' including Port Botany and Sydney Airport to Global Sydney. This connectivity is identified in the priority actions to achieve the goals set in *A Plan for Growing Sydney.*

Issue description – benefits would be limited

Submissions raised concerns that the benefits of the project are limited and that the costs outweigh the benefits. Submissions raised the following issues:

- Global experience of major toll road construction has demonstrated conclusively that these projects are expensive and counter-productive
- The value of time saved would be less than the cost of using WestConnex
- The benefits from Stage 2 (M4M5 Link) do not outweigh the costs. Benefits would become apparent once the whole WestConnex project is built
- Concerns that the benefits of the New M5 in the Updated Strategic Business Case includes other tollways such as the Sydney Gateway, suggesting that the New M5 would not present benefits as a standalone project. These concerns would be amplified if the M4-M5 Link was not delivered
- Travel times would not improve significantly enough to warrant the financial, environmental and infrastructural impacts to various areas and communities, arising from such a plan
- Concern that this project does not provide value for money
- Cost/benefits are not sufficient to warrant the uncertainty of revenue returns and travel time improvements.

Response

Chapter 3 of the EIS details the strategic context and need for the project. Chapter 31 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 Chapter 3 of the EIS.

Currently, road congestion costs NSW $5.1 billion each year, due largely to time delays. This figure is expected to increase to $8.8 billion each year by 2020 (Transport for NSW 2012a).

The existing M5 East Motorway is heavily congested for large parts of the day. It carries over 100,000 vehicles per day, including about 10,000 heavy vehicles; well in excess of its design capacity, the M5 East Motorway currently experiences heavy traffic congestion, slow speeds and unreliable travel times especially in the morning and afternoon peaks, and increasingly at other times of the day and on weekends.

Sydney's population is expected to increase by more than 1.6 million people by 2031 and without major investment in road network infrastructure this growth would result in worsening road congestion. This congestion would in turn affect Sydney's economic competitiveness as a global city.

The New M5 would improve the capacity of the NSW motorway network, particularly along the M5 Motorway corridor, 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 project corridor by:

- Improving the existing motorway capacity to reduce congestion and increase efficiency

- Adding a motorway connection point immediately west of Sydney Airport, supplementing the existing motorway connection to the M5 East Motorway, east of Sydney Airport
- Providing a future motorway connection point for the possible future M4-M5 Link
- Safe guarding a potential future Southern extension link.

The key customers who would benefit from the project include:

- Highly dispersed and long distance passenger movements
- Heavy and light freight and commercial services
- Businesses whose travel patterns are highly dispersed and diverse.

The transport demands of these customers are best served by an efficient motorway connection. The project would meet this project objective by relieving congestion within the project corridor and facilitating efficient passenger and freight movements through Sydney.

The EIS has also identified negative impacts which would arise from the project (summarised in the EIS executive summary) and includes a suite of management measures that aim to ensure the best possible environmental outcomes are achieved during its construction and operation.

WestConnex has been assessed as a program of work and a motorway network in the Updated Strategic Business Case released in November 2015. The economic appraisal completed as part of this updated business case concluded that WestConnex would deliver $1.71 in benefits for every dollar spent.

The EIS acknowledges that other WestConnex projects including the M4-M5 Link are needed to deliver a number of project benefits. However, Section 1.4 of the EIS also identifies a number of project benefits that would be delivered by the project alone and in combination with the King Georges Road Interchange Upgrade, which is currently under construction.

The New M5 project would:

- Provide additional motorway capacity along the main connection to Sydney Airport, Port Botany and south-west 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.

Together with the Southern Connector, the project would:

- Support the economic development of Sydney by providing a high quality and efficient road connection for motorists and freight vehicles between the Global Economic Corridor and Global Sydney (as defined in A Plan for Growing Sydney (NSW Government 2014)
- Provide additional capacity to address existing traffic congestion on the M5 East Motorway and local roads by separating longer distance through traffic from local traffic. Current traffic congestion is causing poor amenity along the M5 corridor and constraining the operation of existing businesses and efficient movement of freight
- Provide better connectivity between local centres adjacent along the M5 Motorway corridor.
- Facilitate urban renewal in precincts adjoining the M5 Motorway corridor by improving local amenity with less traffic noise and vehicle emissions from congested traffic.

WestConnex would also operate as a tolled motorway. A tolled motorway applies a ‘user-pays’ principle, which allows an alternative source of funding to government. This reduces the burden on NSW taxpayers by allowing the project to better fit within the financial capacity of the government, which is one of the objectives of WestConnex.

Issue description – WestConnex is an outdated solution

Submissions raised concerns that construction of the New M5 is a wrong, outdated solution to Sydney's traffic problems. In particular submissions raised the following concerns:

- WestConnex is the wrong answer to a problem which demands a fundamental rethink of how we live in cities
- 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
- In cities like London and Paris, policies around turning over congested areas to public space and reducing car traffic to decrease pollution show just how backwards this urban planning project is
- In a city of five million people, we can never provide enough road capacity to enable everyone to live as far from work as they like, and drive wherever and whenever they like in free flowing traffic
- Concern regarding ongoing costs to future generations from tolls which require economic justification
- Urban radial motorways are cost ineffective
- The government's current model of creating spokes (roads) from a central hub (the city) has been disproven, and should not be used
- Increasing population density and relying on private road transport is fundamentally at odds with each other
- In 1990, the Conservative UK government launched 'Roads to Prosperity', the largest road-building scheme 'since the Romans'. In 1995, the same government abandoned virtually the entire scheme, and 'predict and provide' road building policies in general, as being unfeasible and unhelpful in congested networks. This was codified in the 1994 Standing Advisory Committee on Truck Road Appraisal (SACTRA) report, which showed that induced traffic in congested networks invariably destroys the claimed benefits of extra road capacity. New radial urban freeways would now be unthinkable anywhere in Western Europe, and even the USA and Canada are now belatedly trying to improve public transport, rather than build new freeways. Perth and Melbourne have recently abandoned large freeway schemes. I'm not aware of any other city in the west contemplating freeway construction of the scale of WestConnex. The last motorway built in New York was in 1968
- Transport for NSW should adopt a holistic, long term, approach for NSW. The project should be considered and evaluated as part of an integrated plan (for example with, Sydney Metro, the 2nd Harbour crossing, the light rail projects, West Sydney Airport, Badgerys Creek City, the M9, the Epping-Chatswood 'upgrade' and other proposed projects) to improve connectivity
- Other similar toll road projects have failed
- Alternative transport options have not been considered. Better options include the Eco Transit proposal as summarised below:
- Buying back the Airport Link and reducing the cost to commuters (estimated cost $250 million)
- Providing a link between Sydenham Station to the University of NSW and the Randwick Health Precinct via the Airport Line with connections to the Southern Industrial Complex (estimated cost $450 million)
- Adding a rail station to the Airport Line at Doody Street (estimated cost $75 million)
- Developing a Kingsgrove Last Chance Park and Ride, Kiss and Ride and Bus Turnback area which would allow people to access the Airport Link reducing number of cars travelling on M5 (estimated cost $70 million)
- Other alternative transport projects proposed by submissions included:
- Completion of the Maldon Dombarton rail line
- Parramatta-Epping rail link
- Regional considerations such as transport links to Newcastle and Wollongong

- Faster trains to Newcastle
- Wollongong to Central Station in one hour by train
- Sydney to Canberra
- Matiland to Brisbane
- An inland railway
- Other rail in regional New South Wales
- Improve General Holmes Drive to Eastern Distributor link.

Response

Consideration of the project against a range of other alternatives has been undertaken in accordance with the SEARs and is presented in Section 4.2 of the EIS.

As described in the Updated Strategic Business Case, Sydney has an extensive and growing public transport system, consisting of buses, heavy and light rail and ferry services. However, around 70 per cent of all commuters across metropolitan Sydney travel by car. This is unsurprising, as over 60 per cent of jobs are outside Sydney's major centres. Public transport is simply unable to provide a convenient alternative for a large proportion of travellers given the diffuse nature of this employment and the diverse purposes of many trips.

In the context of the *NSW Long Term Transport Master Plan* (Transport for NSW, 2012) and the *State Infrastructure Strategy 2012-2032* (Infrastructure NSW, 2012), the Government is making significant investment in both roads and public transport. This includes:

- Sydney Metro City and Southwest, which would extend the Sydney Metro Northwest via St Leonards and North Sydney, across the Harbour and into the Sydney CBD. From Sydney CBD, the Metro would connect to an upgraded Bankstown Rail Line
- Sydney Light Rail, including construction of a new CBD and South East Light Rail Line along the corridor between Sydney CBD and Randwick/Kingsford
- Upgrades and enhancements to the suburban rail network.

Although investment is being made in public transport infrastructure, the continued demand for the diverse movements of people, goods and services across Sydney means continued investment is needed in the city's road network.

The New M5 would provide immediate operational benefits in relieving congestion along the M5 East Motorway, including a reduction in travel times and improvements in road safety. Investment in the project, and other WestConnex stages, would facilitate a step change in network performance, enabling delivery of major city shaping improvements and delivering economic growth. The project would improve accessibility to jobs in Sydney's CBD and east and would facilitate the flow of goods and people, and as a result industry investment and employment, in Sydney's south west centres.

Without this major investment in road network infrastructure and with Sydney's population expected to increase by more than 1.6 million by 2031, worsening congestion would have a direct impact on Sydney's economic competitiveness as a global city.

Local benefits would also be realised as a result of the project, helping to build on Sydney's reputation as a liveable and connected urban centre.

Around the St Peters interchange, local road upgrades would improve access to St Peters, Marrickville, Alexandria and Mascot, providing new active transport and motor vehicle links to these suburbs. By upgrading Euston Road and Campbell Road / Campbell Street as well as providing two new road crossings over the Alexandra Canal, substantial new capacity would be created around the St Peters area, directing through traffic along these roads and away from suburban streets and residential properties.

Along King Street, through traffic which currently uses this road would have an underground bypass once the M4-M5 Link is completed. Also, when upgraded, Campbell Street / Campbell Road and Euston Road would provide an alternative to Sydney Park Road, Princes Highway and King Street, which would assist in alleviating traffic congestion along these roads in the peak-flow direction, moving traffic away from residences and businesses.

Active transport infrastructure to be implemented as part of the project would improve connectivity for cyclists and pedestrians by providing a more integrated network. The project would deliver around 14 kilometres of new or upgraded pedestrian and cyclist link, much of which would be physically separated from the road network.

Issue description – the project is inconsistent with community objectives

Submissions raised concerns that the justification for the WestConnex project is inconsistent with community wants and needs. Particular concerns raised included the following:

- The Technical working paper: Social and economic is inconsistent with the vision that City of Sydney residents have for their city and does not reflect the community's views and needs. The project was not developed in the best interests of the people of NSW
- The project would be used by less than one per cent of the NSW population each day, while being paid for by the whole population
- The project would mainly benefit freight
- The project does not create a modern, sustainable (economically, socially and environmentally) city and does not increase the city's liveability and mobility. It would be detrimental to the viability of existing attempts at urban renewal such as Green Square and Ashmore. It would knowingly undo the good work that has been done in Sydney's inner city areas over the last few years
- How would additional traffic capacity improve the liveability of Sydney?
- How would the project adequately connect the city?
- Bicycle tracks are planned for the Sydney Park area and therefore a motorway is not needed
- The strategic justification for the New M5 does not hold up to scrutiny and is inconsistent with the NSW Government's strategic planning and policy framework. In particular WestConnex:
  - Is inconsistent despite its inclusion in the 2012 State Infrastructure Strategy and the Long Term Transport Master Plan
  - Is not the central focus of the Transport Master Plan
  - Fails the objectives of the NSW Transport Master Plan with its main initiatives to address the lack of rail connectivity; by enhancing the current radial mode to be a more networked and connected system. It also included complementary improvements with other modes, such as increase dedicated bus lanes plus BRT, increased cycle-ways and encouraging walkability. The liveability of communities and protection of the environment was a key outcome of the Plan
  - Is not in line with the goals of Sustainable Sydney 2030
  - Does not align with the documents Sydney's Walking Future and Sydney's Cycling Future
- How does the project align with A Plan for Growing Sydney
- Project needs justification as to why we need road improvements when the city cannot handle the current traffic load
- The project does not cater for the diverse travel demands along these corridors that are best met by road infrastructure
- The EIS does not include information on whether future users of the existing M5 East Motorway would choose to use a new motorway.

Response

Traffic analysis undertaken for the New M5 project shows benefits to communities relying on local roads in south west Sydney and in St Peters. Without the project, forecast growth in traffic through the St Peters road network would result in significant congestion and corresponding reductions in average traffic speed. With the project, travel time through the St Peters area during both the morning and afternoon peak is forecast to reduce for both 2021 and 2031 scenarios.

Local benefits would build on Sydney's reputation as a liveable and connected urban centre. The project would support the important work done to date in Sydney's inner suburbs to grow multi-modal connectivity through:

- Upgraded local connections which would provide safe and efficient movements to areas such as Marrickville, Mascot and Green Square
- More than 14 kilometres of new and upgraded cycling and pedestrian paths would link residents of St Peters, Alexandria and Mascot, much of which would be separated from the road network
- Two new road crossings over Alexandra Canal that would address existing bottlenecks on the Ricketty Street Bridge and connect the New M5 with Sydney's arterial network, servicing the southern and eastern suburbs.

The New M5 and the future M4-M5 Link would also provide an underground bypass alternative to a number of parallel surface routes, resulting in reduced traffic volumes along Princes Highway, with commensurate reductions in traffic related impacts on residential properties and businesses along the highway.

In preparing the *NSW Long Term Transport Master Plan* (Transport for NSW, December 2012), 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. As part of that work, the need to complete Sydney's motorway network, including completion of the M4 Motorway, provision of additional capacity along the M5 Motorway corridor and connection of the M4 Motorway and M5 Motorway was identified. This need forms the basis of the WestConnex program of works.

Provision of motorway solution does not alter the Government's commitment to deliver the other, non-motorway projects detailed in the Long Term Transport Master Plan.

The NSW Government is committed to investing in a range of public transport projects. The *NSW Long Term 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 New M5 and the broader WestConnex program of works would facilitate urban renewal and improve the ability of communities to utilise space more efficiently. Reducing congestion and through traffic in a number of communities would enable road space to be reallocated to public transport and has the potential to improve air quality in these areas.

The project would also result in reductions to traffic on surface arterial roads, which would facilitate urban renewal and contribute to improved liveability. The project also has the potential to play a key role in facilitating social inclusion, by providing better access to employment locations and connecting people to social and cultural hubs.

NSW Long Term Transport Master Plan

Under the *NSW Long Term Transport Master Plan* (Transport for NSW, 2012a) (Transport Master Plan), WestConnex is identified as a critical link in Sydney's motorway network and an immediate priority for the NSW Government. The Transport Master Plan recognises that WestConnex would support Sydney's long-term economic growth through improved motorway access and connections linking Sydney's international gateways including the Sydney Airport, Port Botany with Western Sydney and employment areas across Sydney.

Within the context of the Long Term Transport Master Plan, it is acknowledged that a motorway solution would be required. This motorway solution is provided in the form of the WestConnex program of works, including the New M5 project.

Sydney's Cycling Future

The Transport Master Plan and Sydney's Cycling Future (Transport for NSW, 2013b) provide the strategic policy direction to ensure 'that the needs of bike riders are built into the planning of new transport and infrastructure projects'.

The project would support Sydney's Cycling Future objectives by:

- Maintaining and, where feasible, improving network connectivity
- Investigating opportunities for enhanced cycling facilities, where there is a substantial reduction in traffic as a result of the new infrastructure
- Relocating the cycling facilities to provide long-term enhancement, where existing cycling facilities, or access to them, are directly affected during or post-construction.

Section 5.4.2 and Section 5.7.9 of the EIS describe the changes and enhancements to cycling infrastructure and facilities. Further details regarding pedestrian and cyclist connectivity and safety is also provided in **Section 5.8.11** of this report.

Sydney's Walking Future

Sydney's Walking Future (Transport for NSW, 2013c) states that the NSW Government would plan and deliver provisions for walking within key transport projects and in corridor planning. WestConnex, and the New M5 project, would support Sydney's Walking Future strategies by:

- Improving pedestrian network connectivity around the St Peters interchange
- Improving the quality and standard of existing facilities around the western surface works and St Peters interchange
- Improving pedestrian and cyclist safety, particularly at intersections around the St Peters interchange.

Section 5.4.2, Section 5.6.3 and Section 5.7 of the EIS describe the changes and enhancements to pedestrian infrastructure and facilities. Further details regarding pedestrian and cyclist connectivity and safety is also provided in **Section 5.8.11** of this report.

Issue description – cumulative impact of adding more urban motorways.

Submissions raised concerns that the EIS does not consider the cumulative costs of adding more urban motorways to those previously built through the heart of Sydney since the 1950s. The submissions raised the following issues of concerns:

- Following decades of road expansion and consequential sprawl, Sydney now spends more of its GDP on transport compared to the average European or Asian city
- Serious human health impacts are linked to petrochemical vehicle emissions/smog, including:
  - Lung cancer
  - Asthma
  - Heart disease
  - Impaired lung development in children living near motorways/exhaust stacks
- Waterways contaminated with road runoff (heavy metals and carcinogens in brake and clutch dust, exhaust particulates etc.)
- High traffic crash costs (of deaths/traumatic injuries and material damage)
- Urban sprawl and increasing commuting distances
- Social isolation for non-drivers living in car dependent suburbs

- Noise pollution from traffic and its impacts on sleep
- Impacts on visual amenity (pollution stacks, concrete interchanges, concrete flyovers)
- Extreme summer temperatures (urban heat island effect)
- Community destruction and severance
- Destruction of heritage
- Less incidental physical activity from walking and cycling (including to/from public transport), resulting in higher rates of obesity, diabetes, cancer and heart disease
- Increased chauffeuring burdens for parents and carers
- Less independence for children
- High per capita greenhouse gas emissions.

Response

The WestConnex program of works involves the construction and operation of a 'missing link' in Sydney's motorway network, as part of a broader program of projects and initiatives to deliver a modern, integrated transport system for Sydney. This broader program of projects and initiatives is detailed in the *NSW Long Term Transport Master Plan* (Transport for NSW, December 2012).

Each of the assessments presented in the EIS 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. The EIS demonstrates that the project would not have an unacceptable impact on the environment, local amenity or human health.

The proposed mitigation measures would minimise adverse social and environmental impacts in the local area during construction and operation of the project as far as feasible and reasonable.

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 and a long term reduction in greenhouse gas emissions
- The closure and remediation of the Alexandria Landfill, which would improve the environment at this location, resolving impacts of this contaminated land and allowing for a more beneficial end use of this site.
- Enhancing cycling and pedestrian infrastructure around the St Peters interchange, improving social welfare by providing greater connectivity for cyclist and pedestrian journeys.

Issue description – need for project when existing projects and planned upgrades are occurring

Submissions raised concerns regarding the justification for the project when other projects are being planned or constructed which would achieve the same goal as WestConnex. The following examples were given:

- The project's justification (to increase the road freight accessibility of Port Botany and Sydney Airport) does not take into account the new intermodal terminals at Moorebank and St Marys, along with the planned upgrades to the Port Botany rail freight rail line, this would significantly increase the share of freight that can leave/enter Port Botany by rail. Therefore the New M5 is not required
- Regional freight hubs in Sydney's west negate the need for such large infrastructure

- Stage 1 (M4 Widening and M4 East) and Stage 3 (M4-M5 Link) of WestConnex provide an alternative east-west route through inner Sydney, reducing demand for the M5 East Motorway corridor. For example a truck travelling from Auburn to Port Botany would choose to use the WestConnex Stage 1 and Stage 3 tunnels instead of using King Georges Road and the M5 East Motorway. As a result the Stage 1 and Stage 3 tunnels can be seen to be competing with the M5 East Motorway corridor for traffic. The extent to which this improves traffic in the M5 East Motorway has not been discussed in the EIS
- There is no justification for WestConnex. Sydney's orbital motorway was completed in 2005 when the M7 opened
- There is an unused tramline that runs through Erskineville. Why isn't infrastructure like this being used first before projects like this are even considered?
- The Badgerys Creek airport line can legitimately be seen as offering a possible alternative to WestConnex.

Response

As described in the Updated Strategic Business Case the NSW Freight and Ports Strategy examined whether the shift from road to rail freight would address traffic congestion on the M4 and M5 motorways. At the time the strategy was prepared, around 14 per cent of containerised freight from the major ports was carried by rail. The NSW Government has set a target of 28 per cent.

Given the predicted population growth and increase in total freight volumes, even if this target was achieved, there would still be increases in road freight volumes. Specifically, the strategy found that: 'even with the targeted increase in rail mode share, early modelling results indicate the M4 and M5 would not be able to accommodate the additional container traffic when combined with background growth from employment and population by 2031'.

Major 'freight activity precincts' across Sydney are concentrated on Port Botany, Sydney Airport and western Sydney, including current and future terminals (Chullora, Macarthur, Enfield and Moorebank) and the Western Sydney Employment Lands. These precincts are largely located on the city's major roads – particularly along the M4, M5 and M7 motorways – and rail lines, as well as at Port Botany and Sydney Airport. There are also other discrete freight trip generators, historically located in areas which have otherwise evolved beyond their industrial roots such as the port facilities at Glebe Island and White Bay.

These hubs are dependent on good road infrastructure to ensure that trucks are able to move goods. Even those served by freight rail, such as the intermodal terminals, act as intermediary points between the road and rail networks, necessitating high quality connectivity on both networks.

Port Botany poses a significant transport challenge. NSW container freight volumes in 2010 were around 1.9 million units (measured in 'twenty-foot equivalent units' of containers) per annum. By 2020, this is forecast to grow to between three and 3.6 million; reaching between 4.9 and seven million by 2030.

Given the predicted increase in container numbers, there would be a significant increase in heavy vehicle movements supporting Port Botany, regardless of the success of other freight movement projects. Even with Enfield and Moorebank intermodal terminals, which would both be operational over the next few years – thereby boosting freight rail capacity substantially – truck movements are still forecast to almost triple, reaching around 8,000 per day by 2031.

5.3.2 Project cost and funding – New M5 and WestConnex

4,835 submitters raised issues regarding the cost and funding associated the New M5 and the full WestConnex program of works.

Issue description – cost of the project

Submissions raised general concerns regarding the initial cost of the project and the increasing budget including:

- The project would be a waste of public funds, and does not represent value for money
- The project cost is unjustified. It is estimated that every kilometre is costing $500 million
- The cost of the project cannot be assured and is escalating at a rate of $2 billion a year. The cost increased from $11.5 billion (first business case July 2013) to $16.8 billion (second business case November 2015); an increase of $5.3 billion in just over two years. The current $17 billion cost is far in excess of the original estimate. Submissions suggested that there are indications that this may become $20 billion when local road remediation is included
- The overspend of $6 billion should be examined by auditors
- How can it be sure that cost would not blow out rendering the project too expensive to complete?
- What would be the total cost?
- The EIS business case says that with toll roads, 'losses to investors due to traffic demand forecast being overly optimistic. This has led to a situation where it is likely the private sector sponsors would be unwilling to take on all or part of the development and start up traffic risk'. Why does the NSW Government think that WestConnex can be profitable when the private sector does not?
- WestConnex and the new M5 are financially unviable and would cause a significant lost opportunity cost for all of NSW
- There is no modelling for cost containment, which would be a significant impact to the taxpayers of NSW and investors via investments made in the project through their superannuation funds. This should be a cause for concern.
- WestConnex and the New M5 are financially unviable
- There has been a lack of transparency when allocating funding to this project.

Response

The capital cost of the New M5 component of the WestConnex program of works is around $4.3 billion. While the project would involve a significant capital outlay, it would address a number of existing network issues resulting in significant financial benefits to the economy. For example, road congestion currently costs NSW $5.1 billion each year, due largely to time delays. This figure is expected to increase to $8.8 billion each year by 2020 (Transport for NSW, 2012a).

An assessment of the economic viability of WestConnex program of works has been undertaken by KPMG, an independent professional services firm using Cost Benefit Analysis and wider economic impacts analysis. Economic benefits provided as a result of the project include network reliability benefits, vehicle operating cost savings, travel time savings, crash cost savings and others.

The economic analysis demonstrates that the WestConnex program of works is economically viable and would return $1.71 (2015 dollars) for every dollar invested. This would extend to $1.88 with the inclusion of wider economic benefits.

A sensitivity analysis was undertaken to assess the impact of changes in key assumptions on the conventional cost benefit analysis findings (i.e. excluding wider economic impacts). Key findings of the sensitivity analysis included:

- WestConnex remains economically viable against all sensitivity tests undertaken, with benefit cost ratios remaining above one in all cases
- WestConnex remains economically viable against potential cost increases of up to 30 per cent to both capital and operating costs, reducing the benefit cost ratio to 1.5 (with wider economic impacts), which is still considered a very positive benefit cost ratio.

The $16.8 billion figure quoted in submissions is the capital cost estimated for the whole of the WestConnex program of works, as presented in the Updated Strategic Business Case, which includes the capital cost for WestConnex Stages 1, 2 and 3 (M4 East, New M5 and M4-M5 Link).

This figure takes into account enhancements to the project since the initial reference design in 2013, which include:

- The acceleration of Stage 2 (the New M5) from a 2020 completion to a 2019 completion date, and the confirmation of its alignment
- The realignment of Stage 3 (M4–M5 Link), with a 'northern extension' being incorporated. WestConnex originally followed Parramatta Road to Camperdown, but with this change would now duplicate the City West Link to Rozelle, providing connectivity to the Anzac Bridge and Victoria Road
- Works to enable extension of the M4–M5 Link to connect with the proposed Western Harbour Tunnel and Beaches Link and Southern Connector (part of South Link).

A competitive tender process for the design and construction of the New M5 was used to derive an innovative, cost effective and environmentally-responsive design (refer to Section 4.1.3 of the EIS). The competitive tender process was also used as a mechanism to test and confirm the cost of the project (including upfront capital costs and ongoing operational expenditure).

The ongoing management of costs on the project is subject to a robust governance structure that includes the Auditor-General recommended 'gateway process', in line with the Infrastructure Investor Assurance Framework. All major decisions regarding WestConnex are subject to a Cabinet-approval process. These decision points are aligned to the Infrastructure Investor Assurance Framework. As components of WestConnex move through the project lifecycle, they are subject to an independent gateway assurance review process organised by Infrastructure NSW. The Cabinet or the appropriate Cabinet Committee must provide approval to proceed.

Issue description – financial risk of the project

Submissions were concerned with the financial risk of the project, including the following issues:

- The project is unlikely to recoup costs
- The fiscal risk is too high to proceed
- There is a high risk that toll revenue from the project would not meet forecasts, due to the flaws and optimistic assumptions in the traffic modelling. This may result in financial losses for the government at state and federal level and therefore NSW and Australian taxpayers and also in insufficient funds being available to support Stage 3
- The cost of the development is continually changing; there is a risk the costs could increase even more
- Billions of dollars of public money are being paid to private companies, and the public not the private sector would carry the risk on this project
- If the road fails, ordinary people would be forced to pay for it through tolls and degradation of amenity
- It is going to be very expensive to dismantle WestConnex when it fails
- The cost of the WestConnex would never be paid off.

Response

WestConnex has been assessed as a program of work and a motorway network in the Updated Strategic Business Case released in November 2015. The economic appraisal completed as part of this updated business case concluded that WestConnex would deliver $1.71 in benefits for every dollar spent.

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 are being established for the delivery of each stage of WestConnex, and these 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.

A full financial appraisal for the project is presented in the Updated 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.

Issue description – project funding

Submissions queried how the project would be funded (private, tax payers, tolls), how it would impact spending on other public service and the fairness for tolls. Particular concerns included:

- How much government funding would be needed to complete it?
- The Project does not fit within the financial capacity of the State and Federal Governments, in partnership with the private sector
- Concern that funding is being sourced from selling off state heritage buildings and areas
- Tolling would fund less than one third of the $18 billion cost of WestConnex, leaving at least $12 billion to be funded by tax payers, the majority of which (99 per cent in NSW) would not utilise the toll road. Taxpayer funds should offer better value for money
- Regional NSW should not have to assist in funding the project
- The project does not optimise user pays contributions to support funding in a way that is affordable and equitable. The project should be able to derive all funds from road users, while leaving some funds from road users to cover significant external costs and to provide some funds for transport alternatives to roads
- Tax payers are funding the road and also have to pay tolls to use it
- The tax payer would be burdened with future costs while private operators make money
- Federal taxes are being diverted away from other causes such as transport, health, education, community housing rural and regional projects and the arts.
- The assumptions behind the EIS's prediction that drivers would decide to start paying this toll years after the toll road opens are not explained.
- The commuter pays strategy would not cover full cost of project.

Response

The NSW Government has committed $1.8 billion to the New M5 project from Restart NSW. In addition, the Commonwealth Government has committed $1.5 billion, and offered a concessional loan of up to $2 billion to fast track delivery of the New M5.

WestConnex has been assessed as a program of work and a motorway network in the *WestConnex Updated Strategic Business Case* (NSW Government 2015) released in November 2015. The economic appraisal completed as part of this updated business case concluded that WestConnex would deliver $1.71 in benefits for every dollar spent.

WestConnex was a recommendation of Infrastructure NSW in October 2012, with Government adopting the concept in the 2012 *State Infrastructure Strategy* and the Transport Master Plan. This was followed by the development of a business case, which was approved by Government in August 2013. An Executive Summary of that business case was publicly released. In November 2015, the Updated Business Case was released, which consolidates the work undertaken in the original business case, with the significant modelling, analysis and scope enhancements completed in the past 24 months.

The Updated Business Case includes:

- A strategic justification for WestConnex in the context of key strategies and plans
- An updated reference design, including details of the options development process that lead to key alignment changes
- Budget and cost estimates for the whole of WestConnex
- Details of the proposed tolling regime
- Traffic demand and operational traffic modelling results, including details of travel time savings and interchange performance
- An economic appraisal, including cost benefit analysis
- A financial appraisal, including project cashflows based on the reference tolling scenario
- Details of staging, procurement and financing
- A description of the project governance model
- Details of environmental and sustainability principles
- A communications and stakeholder strategy.

The Updated Business Case includes technical papers providing additional detail in relation to traffic modelling, economic appraisal, updated strategic environmental review, and timeline of consultation activities.

The Updated Business Case can be found on the WestConnex website site at www.westconnex.com.au/documents/updated_strategic_business_case.pdf

5.3.3 Tolling

1,910 submitters raised issues regarding the tolling of the project.

Issue description – cost of tolling on individuals

Submissions raised issues regarding the cost associated with the New M5 tolls including:

- General concerns over the affordability of tolls. At an estimated $26 a day to travel on the motorway, a five-day-a -week commute would cost around $6000 per year
- Tolls would be unaffordable for all other than trades people, contractors and haulage companies, who would pass on the cost of the tolls to consumers
- Use of the M5 East Motorway was previously free and would now be tolled, creating additional expenses for current users and deterring people from using the road
- Many of the potential users would be from low income households who cannot afford to live near employment centres or railway stations. They would have to pay high tolls while higher income households have access to cheaper roads and public transport. This is hardly equitable
- Impact on cost of living due to toll to travel on the M5 East Motorway which is currently free
- The proposed cost model would not be affordable for many residents, particularly when high parking and vehicle running costs are added to the equation. The tolls are likely to be even less affordable for residents from western and southwest Sydney, where the mean income is below that of residents in the inner city.

Response

A tolled motorway applies a ‘user-pays’ principle that provides an alternative source of funding to government. This reduces the burden on NSW taxpayers by allowing the project to better fit within the financial capacity of the government, which is one of the objectives of WestConnex.

In October 2014, the NSW Government agreed to a broad set of principles for tolling for Sydney’s motorways. The principles would be applied to WestConnex, NorthConnex, the Western Harbour Tunnel and Beaches Link, and the South Link motorways.

WestConnex would deliver a direct benefit to motorists using the M5 East Motorway. After the New M5 is opened to traffic, travel times on the M5 East Motorway would be reduced by up to 45 per cent and travel speeds increased by up to 37 km/h. As a result, trips along the full length of the existing M5 East Motorway would be charged the same as the New M5.

M5 East Motorway motorists would receive the benefit of improved motorway conditions from King Georges Road through to the intersection of Southern Cross Drive and Foreshore Road.

A common tolling approach would be applied across all WestConnex motorways (including the introduction of a toll on the M5 East Motorway):

- 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.

The New M5 and the M5 East Motorway would, when the entire length of either Motorway is travelled, have the same toll, noting:

- To maintain access to Sydney Airport's International Terminal, trips using Marsh Street ramps to and from General Holmes Drive would be toll-free
- Trips through the M5 East Motorway tunnels and intermediate on and off ramps would be discounted from the maximum toll to reflect shorter trip
- Trucks would be tolled at three times that of cars.

Free, alternative traffic routes would remain available to those who choose not to or cannot afford to use the tolled motorway. Tolls would increase from 1 January each year between 2012 and 2040 by four per cent per annum or in line with Consumer Price Index (CPI) (whichever is greater). Between 2041 and 2060, the tolls would increase in line with CPI.

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. The reference tolling regime is provided in Table 9.2 of Chapter 9 (Tolling Regime) in the Updated Strategic Business Case.

Issue description – tolling impacts on western and south western Sydney residents

Submissions raised concerns that residents in western and south west Sydney are unfairly impacted by having to pay a large toll to travel east - west along the M5 East Motorway corridor.

Response

The New M5 is designed to aid commuters travelling between Beverly Hills and St Peters by providing an alternative motorway connection to the M5 East Motorway. Currently, the M5 East Motorway carries more than 100,000 vehicles per day and as a result, motorists experience heavy congestion during most parts of the day, resulting in slow speeds and unreliable travel times. The M5 East Motorway has the slowest typical travel speeds of any of Sydney's main motorways.

As the South West Growth Centre expands and new commercial operations establish along the M7 corridor, travel demand along the M5 East Motorway corridor is expected to continue to grow. Without improvements to the capacity of the M5 East Motorway corridor, travel times during the afternoon peak between King Georges Road in Beverly Hills and Foreshore Road in Botany are expected to increase by about 14 minutes by 2031.

The project would provide much needed additional capacity along the M5 East Motorway corridor, easing congestion and providing improved connections to cater for the forecast growth in employment and population along the corridor.

A tolled motorway applies a 'user-pays' principle that provides an alternative source of funding to government. This reduces the burden on NSW taxpayers by allowing the project to better fit within the financial capacity of the government, which is one of the objectives of WestConnex.

A common tolling approach would be applied across all WestConnex motorways (including the introduction of a toll on the M5 East Motorway):

- 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

The New M5 and the M5 East Motorway would, when the entire length of either motorway is travelled, have the same toll, noting:

- To maintain access to Sydney Airport's International Terminal, trips using Marsh Street ramps to and from General Holmes Drive would be toll-free
- Trips through the M5 East Motorway tunnels and intermediate on and off ramps would be discounted from the maximum toll to reflect shorter trip
- Trucks would be tolled at three times that of cars.

The New M5 would double the capacity of the M5 East Motorway corridor, relieving congestion on the M5 East Motorway and improving reliability. This would deliver improved connectivity between key employment hubs and local communities by removing through traffic from the surface road and local streets, and would cater for the forecast growth in employment and population along these corridors.

The 'user-pays' principles established by the NSW Government reflect these project benefits, supporting funding in a way that is affordable, equitable and fair.

Alternative free arterial routes via Stoney Creek Road, Marsh Road, Forest Road and Airport Drive would be available to road users in western and south western Sydney.

Issue description – length of time tolls would be in place

Submissions raised concerns over the length of time tolls would be in effect for the New M5. In particular submissions queried the following:

- The project would force the public to use privatised toll roads for a time period that would span decades, and the financial burden on the community would be enormous.

Response

As per the NSW Government's tolling principles, tolls can continue while they provide broader network benefits or fund ongoing costs. As discussed above, tolling fees have been determined based on the Government's principles for tolling and are comparable with other tolling regimes in Sydney.

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

5.3.4 Business case - Concerns

2,586 submitters raised issues regarding the release of the business case and its accuracy.

Issue description – adequacy, quality and transparency of the business case

Submissions raised issues regarding the adequacy, quality and transparency of the business case, including:

- The business case is flawed, unsatisfactory and misleading
- There is no real business case for project other than the 2012 Strategy Paper
- The Updated Strategic Business Case does contain enough information about traffic volume and time savings, and demonstrates that WestConnex fails to return its costs and would have a cost benefit ratio well below 1:1. Submissions claimed that the executive business case was found by the NSW Auditor-General to be totally inadequate; 'it did not meet best practice standards' and the Auditor-General 'was not able to form a view [that] the project is a worthwhile and prudent investment for the NSW Government'. Submissions stated that nothing has changed 'Infrastructure NSW should ensure the Major Projects Assurance Framework is fully implemented' said the Auditor-General at the time, and this is still true now
- The Updated Strategic Business Case estimates that 24 per cent of travellers are business travellers. This is not in line with State recommendations, which recommend using a figure between eight per cent and 12 per cent - meaning that at most, eight per cent to 12 per cent of users might be better off. The rest would be worse off
- Table 99 and 100 of Appendix G of the EIS compare 'without project' to '2021 with project' and '2031 full WestConnex'. Figures for '2031 with project' are missing. The Project should not go ahead if it cannot function on its own
- An examination of the stated economic benefits of WestConnex shows these have been pumped up using dubious methodologies, to try to get a positive benefit cost ratio
- This was not an evidence based business case, which assessed all alternative transport solutions and could be subject to independent analysis
- The WestConnex project business case has a large amount of redacted information, mainly associated with traffic modelling and estimated toll revenue and operational costs
- The Government should disclose why information was redacted. Government agencies must abide by a commitment to as full disclosure as possible to account for its management of taxpayer's resources
- There is no 'public interest immunity' for non-disclosure for large road and transport infrastructure. 'Commercial in confidence' excuses for this secrecy can hardly apply when the project is being funded almost exclusively by taxpayers
- Until the full business case is released i.e. one in which critical information such as the cost and toll revenue figures have not been redacted and been independently verified, it cannot be assumed that the project fits within the financial capacity of the State and Federal Governments
- The business case should be audited by the Commonwealth Auditor-General to test its assumptions, correct the inconsistencies, apply Transport for NSW's own Guidelines and establish accountably and transparently the costs and benefits on a credible basis
- It is the responsibility of government, as the proponent of a project, to prepare the strategic business case. Clearly, this business case was prepared by consultants who have vested interests in the outcome
- The government has often referred to the 'WestConnex Business Case Executive Summary' of September 2013 as its business case. This was not an evidence based business case, which assessed all alternative transport solutions and could be subject to independent analysis
- The inevitable concerns are that the business case hasn't changed over the last 5-10 years

- The claim that WestConnex would create more than 10,000 jobs is spurious because an equally large public transport project would also create a similar number of jobs and far more ongoing operational jobs.

Response

WestConnex has been assessed as a program of work and a motorway network in the Business Case which was approved by Government in August 2013. In November 2015, the Updated Business Case was released, which consolidates the work undertaken in the original business case. The economic appraisal completed as part of this updated business case concluded that WestConnex would deliver $1.71 in benefits for every one dollar spent.

As outlined in Chapter 3 of the EIS, the existing M5 East Motorway is heavily congested for large parts of the day. It carries over 100,000 vehicles per day, including about 10,000 heavy vehicles; well in excess of its design capacity. The M5 East Motorway currently experiences heavy traffic congestion, slow speeds and unreliable travel times especially in the morning and afternoon peaks, and increasingly at other times of the day and on weekends.

Sydney's population is expected to increase by more than 1.6 million people by 2031 and without major investment in road network infrastructure this growth would result in worsening road congestion. This congestion would in turn affect Sydney's economic competitiveness as a global city.

WestConnex would deliver a direct benefit to motorists using the M5 East Motorway. After the New M5 is opened to traffic, travel times on the M5 East Motorway would be reduced by up to 45 per cent and travel speeds increased by up to 37 kilometres per hour.

M5 East Motorway motorists would receive the benefit of improved motorway conditions from King Georges Road through to the intersection of Southern Cross Drive and Foreshore Road.

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.

Micro-simulation and micro-analytical traffic models have been used to assess intersection operations adjacent to WestConnex and traffic operations at portals. More detailed modelling results for the New M5 have been presented in Chapter 9 of the EIS.

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, while creating almost 10,000 jobs during the construction phase. Specifically, the project is expected to support around 1,550 construction jobs as well as numerous operational jobs.

The Updated Strategic Business Case for WestConnex 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 an externally managed Business Case Gateway Review.

The NSW Government is committed to investing in a range of public transport projects. The *NSW Long Term 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.

A detailed explanation of the need for the project is presented in Chapter 3 of the EIS. Project benefits are presented **Section 5.3.7** of this report and in Chapter 31 of the EIS.

The Updated Strategic Business Case can be found on the WestConnex website site at www.westconnex.com.au/documents/updated_strategic_business_case.pdf

Consideration of the project against a range of other alternatives has been undertaken in accordance with the SEARs and is presented in Section 4.2 of the EIS.

Issue description – need for a business case

Submissions raised issues regarding the need for a business case to be publicly released prior to a suggested solution to traffic congestion.

Response

Refer to **Section 5.3.4 (1)** for details regarding the publicly available business case.

5.3.5 Business case - Release

535 submitters raised issues regarding the release of the business case.

Issue description – timing of business case release

Submissions raised issues regarding the release of the business case, including:

- The business case for this $16.8 billion project was only released in November 2015 three years after the project was first proposed and only then after intense public pressure, including a parliamentary petition that gathered more than 10,000 signatures from constituents across NSW opposed to WestConnex
- The business case was not released until after a parliamentary debate
- The WestConnex Updated Strategic Business Case was produced after contracts had been signed to build the M4 Widening and the M4 East and was released after the date of the exhibition of the EIS. This suggests that the project was decided on in advance of the business case being prepared, and that the business case was not properly analysed or considered by government prior to embarking on the project
- The business case and benefit cost ratio for WestConnex have still not been provided which tells us that it has been impossible to create a business case that is politically acceptable
- There has not been an opportunity to comment on the WestConnex business case
- No business case has been formally tendered to the public.

Response

WestConnex was a recommendation of Infrastructure NSW in October 2012, with the Government adopting the concept in the 2012 *State Infrastructure Strategy* and the Transport Master Plan. This was followed by the development of a business case, which was approved by Government in August 2013. An Executive Summary of that business case was publicly released.

In November 2015, the Updated Business Case was released, which consolidates the work undertaken in the original business case, with the significant modelling, analysis and scope enhancements completed in the past 24 months.

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.

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 an externally managed Business Case Gateway Review.

The Updated Business Case includes:

- A strategic justification for WestConnex in the context of key strategies and plans
- An updated reference design, including details of the options development process that lead to key alignment changes
- Budget and cost estimates for the whole of WestConnex
- Details of the proposed tolling regime
- Traffic demand and operational traffic modelling results, including details of travel time savings and interchange performance
- An economic appraisal, including cost benefit analysis
- A financial appraisal, including project cashflows based on the reference tolling scenario
- Details of staging, procurement and financing
- A description of the project governance model
- Details of environmental and sustainability principles
- A communications and stakeholder strategy.

The Updated Business Case includes Technical Papers providing additional detail in relation to traffic modelling, economic appraisal, updated strategic environmental review, and timeline of consultation activities.

The Updated Business Case can be found on the WestConnex website site at www.westconnex.com.au/documents/updated_strategic_business_case.pdf.

The Updated Business Case was not required to be submitted for public comment, as per the NSW Treasury Guidelines for Capital Business Cases, December 2008.

5.3.6 General support

15 submitters expressed general support for the project.

Issue description – support for the project

Submissions expressed general support for the project.

Response

The support for the project is noted.

5.3.7 General objection

137 submitters raised issues regarding general objections to the project.

Issue description – objection to the project

As well as general objections to the project proceeding, submissions stated the following general objections:

- The project would impact communities, those directly affected and those not, by demolitions and fragmentation. The project would cause irreversible, detrimental impacts on surrounding suburbs and communities as well as significant and unacceptable environmental impacts
- Even if the New M5 is completed, local pollution and noise hot spots would remain

- Work toward a smarter, long-term and visionary solution to live in a city where the wellbeing of its residents is protected and promoted alongside financial interests. WestConnex is transformational infrastructure, there is no benefit for economic improvement and better land use
- Strong objection to the construction of the WestConnex, tunnels, flyovers, and exit roads around Sydney Park, St Peters, Euston Road and King Street
- St Peters interchange would be a disaster for the entire city. It would be detrimental to the local community on multiple levels and in this instance is short sighted
- Cities should be for people and not cars
- Western Sydney was promised economic infrastructure in the west, creating CBDs in the west. Instead, this government gives them another tunnel to be trapped in every morning and every evening as they commute to the CBD
- Sustaining and enhancing communities such as Alexandria should be the Government's number one priority and not destroying those communities with developments such as WestConnex which would only cater to unsustainable traffic
- Stop cutting corners and taking the most profitable and cheapest options
- Concerned about politicians commitment to a project when there are many impacts.

Response

The WestConnex program of works involves the construction and operation of a 'missing link' in Sydney's motorway network, as part of a broader program of projects and initiatives to deliver a modern, integrated transport system for Sydney. This broader program of projects and initiatives is detailed in the *NSW Long Term Transport Master Plan* (Transport for NSW, December 2012).

Each of the assessments presented in the EIS 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.

The mitigation measures proposed would minimise adverse social and environmental impacts in the local area during construction and operation of the project as far as feasible and reasonable.

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 and a long term reduction in greenhouse gas emissions
- The closure and remediation of the Alexandria Landfill, which would improve the environment at this location, resolving impacts of this contaminated land and allowing for a more beneficial end use of this site.
- Enhancing cycling and pedestrian infrastructure around the St Peters interchange, improving social welfare by providing greater connectivity for cyclist and pedestrian journeys.

WestConnex has been assessed as a program of work and a motorway network in the Updated Strategic Business Case released in November 2015. The economic appraisal completed as part of this updated business case concluded that WestConnex would deliver $1.71 in benefits for every dollar spent.

As outlined in Chapter 3 of the EIS, the existing M5 East Motorway is heavily congested for large parts of the day. The M5 East Motorway currently experiences heavy traffic congestion, slow speeds and unreliable travel times especially in the morning and afternoon peaks, and increasingly at other times of the day and on weekends. It carries over 100,000 vehicles per day, including about 10,000 heavy vehicles; well in excess of its design capacity.

The New M5 would deliver additional capacity for the M5 Motorway corridor, resulting in:

- A reduction of up to 60,000 vehicles on the M5 East Motorway on an average weekday, relieving congestion and improving travel reliability

- A reduction in average travel times (generally by half) between 2021 and 2031, and a doubling of average travel speeds during the morning and afternoon peak, improving the efficiencies of intrastate and interstate freight movements through travel time saving and reduced operating costs
- An alternative to the M5 East Motorway, providing network resilience in the event of incidents or planned maintenance.

Without the New M5, conditions on the M5 East Motorway would continue to deteriorate.

Local benefits would also be realised as a result of the project, helping to build on Sydney's reputation as a liveable and connected urban centre. The project would support the important work done to date in Sydney's inner suburbs to grow multi-modal connectivity through:

- Upgraded local connections which would provide safe and efficient movements to areas such as Marrickville, Mascot and Green Square
- More than 14 kilometres of new and upgraded cycling and pedestrian paths linking residents of St Peters, Alexandria and Mascot, much of which would be separated from the road network
- Two new road crossings over Alexandra Canal that would address existing bottlenecks on the Ricketty Street Bridge.

The New M5 and the future M4-M5 Link would also provide an underground bypass alternative to a number of parallel surface routes, resulting in reduced traffic volumes along the Princes Highway, with commensurate reduction in traffic related impacts on residential properties and businesses along the highway.

Chapter 3 of the EIS establishes the strategic context and need for the project, and Chapter 30 of the EIS provides a summary of the strategic need and justification.

Section 5.3.1 of this report provides a summary of how the project objectives would be met.

5.3.8 Project benefits

37 submitters raised issues regarding the benefits of the project.

Issue description – what are the benefits of the New M5?

Submissions queried what the benefits of the New M5 would be, as these are not clearly listed in the EIS. In particular submissions queried the following:

- What actual benefit would WestConnex have for Sydney and the environment and individuals?
- Concern that the project has no clear economic or 'transformational' benefit.

Response

The EIS acknowledges that other WestConnex projects, including the future M4–M5 Link, are needed to deliver a number of project benefits. However, Section 1.4 of the EIS identifies a number of project benefits that would be delivered by the project alone and in combination with the King Georges Road Interchange Upgrade, which is currently under construction.

The New M5 project would:

- Provide additional motorway capacity along the main connection to Sydney Airport, Port Botany and southwest Sydney, resulting in the following benefits:
  - Reliability and savings in travel time for through-traffic
  - A reduction of up to 60,000 vehicles on the M5 East Motorway on an average weekday, relieving congestion and improving travel reliability
  - A reduction in average travel times (generally by around half) between 2021 and 2031, and a doubling of average travel speeds during the morning and afternoon peaks, improving the efficiencies of intrastate and interstate freight movements through travel time saving and reduced operating costs

  - An alternative to the M5 East Motorway, providing network resilience in the event of incidents or planned maintenance
- 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.

Together with the Southern Connector, the project would:

- Support the economic development of Sydney by providing a high quality and efficient road connection for motorists and freight vehicles between the Global Economic Corridor and Global Sydney (as defined in *A Plan for Growing Sydney* (NSW Government 2014)
- Provide additional capacity to address existing traffic congestion on the M5 East Motorway and local roads by separating longer distance through traffic from local traffic
- Provide better connectivity between local centres adjacent to the M5 East Motorway corridor
- Facilitate urban renewal in precincts adjoining the M5 East Motorway corridor by improving local amenity with less traffic noise and fewer vehicle emissions from congested traffic.

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 and a long term reduction in greenhouse gas emissions
- The closure and remediation of the former Alexandria Landfill, which would improve the environment at this location, resolving impacts of this contaminated land and allowing for a more beneficial end use of this site
- Enhancing cycling and pedestrian infrastructure around the St Peters interchange, improving social welfare by providing greater connectivity for cyclist and pedestrian journeys. The pedestrian and cycling infrastructure would support integration of the surrounding area with Sydney Park
- Diverting north-bound through traffic away from residents and businesses along the Princes Highway and Sydney Park Road onto Euston Road.

Chapter 31 of the EIS provides a summary of the strategic need and justification for the project, including the manner in which the project would fulfil the objectives outlined in Chapter 3 of the EIS.

Additional open space

In the western part of the project, connectivity between existing areas of open space would be improved through upgraded shared paths within the M5 Linear Park. The shared paths would be enhanced by new landscaping which would assist in screening the motorway and associated noise barriers. The upgraded shared paths and landscaping would integrate with similar upgrades being undertaken for the King Georges Road interchange upgrade project.

In the eastern parts of the project, significant new areas of open space would be created around the St Peters interchange. A master plan has been developed, encompassing the entire interchange site and ensuring its integration with surrounding areas. The majority of the open space to be provided by the master plan would be completed as part of the project. Specifically, the project would extend the parklands of Sydney Park further south, providing much needed open space for a growing population. Featuring landscape mounds, the design of the interchange parklands would continue the features of Sydney Park. This space would be accessible from shared paths in the east connecting to Sydney Park or via a dedicated entrance at the corner of Canal Road and Princes Highway.

Active transport

The project would deliver around 14 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.

During the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. Following exhibition of the EIS and in response to submissions, additional work has been undertaken to build on the work completed to date, and to ensure pedestrian and cyclist facilities are consistent with existing State and local government policies and strategies.

New active transport infrastructure in the St Peters, Mascot and Alexandria precincts would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure.

Issue description – who benefits from the New M5?

Submissions questioned who the New M5 would benefit. In particular the following issues were raised:

- Who benefits from this project?
- Regions such as the Central Coast would see little to no benefit from this project, particularly if its nebulous 'wider economic benefits' never materialise
- Only a small amount of people would benefit from this project (one per cent of NSW would utilise), however many more people would be affected
- 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
- Project would benefit companies/people with vested interests, including construction companies, toll operators and politicians, not the community
- The residents of Sydney's west, would not actually experience any real benefits as savings in travel times are not significant
- The WestConnex program of works clearly benefits the construction industry
- It would neither reduce congestion nor connect communities and would only create construction jobs (which would still be created if money was reallocated to more worthwhile projects).

Response

The Updated Strategic Business Case identified the key user groups for WestConnex as those that are reliant on road based travel, and as such are likely to benefit most from the motorway. These groups 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.

In addition to the above, the increased areas of open space and pedestrian and cycle paths would benefit local users and the community.

Chapter 3 of the EIS establishes the strategic context and need for the project, and Chapter 30 of the EIS provides a summary of the strategic need and justification.

The WestConnex program of works involves the construction and operation of a 'missing link' in Sydney's motorway network, as part of a broader program of projects and initiatives to deliver a modern, integrated transport system for Sydney. This broader program of projects and initiatives is detailed in the *NSW Long Term Transport Master Plan* (Transport for NSW, December 2012).

As detailed in Growing Sydney, Sydney is expected to have 689,000 additional jobs by 2031, many of which are expected to be located in Western Sydney in response to an expected population increase of 900,000 in the area. A large percentage of these jobs would be located in zoned employment areas

or in areas under investigated, such as around the future Western Sydney Airport, which is expected to produce up to 19,900 jobs for Western Sydney (Western Sydney Airport Alliance, 2013).

As outlined in Growing Sydney, 28 per cent of workers who live in western Sydney work in other areas of Sydney and therefore are required to travel to work by car or on public transport

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, 2012a). Although jobs growth in Western Sydney is forecast to be strong, surpassing that of the eastern half of the city in the coming decades, it is not forecast to match the job numbers of the city's eastern half (Bureau of Transport Statistics, 2014). There is still a need to provide a link between Western Sydney and other centres in Sydney such as the Sydney CBD, Sydney Airport and Port Botany. 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 south-west, the project would also encourage business and industry investment and, as a result, employment opportunities, in south-west centres.

The Technical working paper: Traffic and transport (Appendix G of the EIS) provides a detailed assessment, based on traffic modelling, of the operational traffic impacts of the project, including and assessment of the New M5 project and the full WestConnex program of works.

The assessment concluded (refer to Section 10.4 of the Technical working paper: Traffic and transport in Appendix G of the EIS) that the project would result in large reductions in vehicle travel time along the M5 East Motorway corridor between King Georges Road in the west and Foreshore Road in the east. This would ensure greater accessibility between Sydney's south-western suburbs with the Sydney CBD as well as the airport and port. The New M5 would also operate at an improved Level of Service compared to the current road network and would ultimately provide connectivity to the M4–M5 Link, making it a desirable choice for motorists.

The EIS acknowledges that other WestConnex projects, including the future M4–M5 Link, are needed to deliver a number of project benefits. However, Section 1.4 of the EIS identifies a number of project benefits that would be delivered by the project alone and in combination with the King Georges Road Interchange Upgrade, which is currently under construction.

5.3.9 Benefit cost ratio

17 submitters raised issues regarding the benefit cost ratio of the project.

Issue description – benefit cost ratio queries

Submissions raised concerns reading the outcome and adequacy of the benefit cost ratio. In particular the following issues were raised:

- The benefit cost ratio for WestConnex still has not been provided, which indicates that it has been impossible to create a business case that is politically acceptable
- The use of economic multiplier as the economic model indicates assumptions of economic success, and allows for the benefits of the project to be given in more definite terms than the costs (making them seem more 'real' and more likely).
- No benefit cost ratio 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 benefit cost analysis of WestConnex is evaluated over a 40 year period. Relieving traffic congestion on the corridor appears to be a major objective of the project. The project reaches capacity in the M4 East tunnel within eight years after project completion. This does not seem to be an effective means of relieving congestion. The cost-benefit analysis should include costs of additional measures required over the remaining 32 years of the project life to maintain the claimed congestion and travel time savings. If included, it is likely that the project costs would significantly outweigh any benefits.
- The project has a very poor benefit cost ratio

- One fact that questions the credibility of the WestConnex Updated Strategic Business Case is its assertion of a benefit cost ratio for WestConnex of between 1.71 (without wider economic benefits) and 1.88 (with wider economic benefits). This is four times the benefit cost ratio of 0.45 for Melbourne's comparable East West Link. The WestConnex benefit cost ratio is likely to be significantly less than 1.0
- The resulting congestion would mean that the benefit cost ratio would fall well below 1 and prove to be a burden for taxpayers and investors
- There is no valid reason for this project to go ahead without a full inquiry into the cost-benefit
- Negative benefit cost ratio (these figures have been fudged in reports)
- A dedicated freight link has been suggested in years gone by, but regular car traffic was added to improve the benefit cost ratio of the project. Since this makes the project both more destructive and less effective, this suggests a major flaw in the way cost benefit analysis is currently applied to transport projects
- The benefit cost ratio is still better than 1 however, it does not accommodate future cost blow outs
- The project fails to return its costs at a ratio of 1:1.

Response

WestConnex has been assessed as a program of work and a motorway network in the Updated Strategic Business Case released in November 2015. The economic appraisal completed as part of this updated business case concluded that WestConnex would deliver $1.71 in benefits for every dollar spent.

KPMG has undertaken sensitivity analysis to examine the strength of the economic case for WestConnex. The economic analysis adopts the NSW Treasury definition for the benefit cost ratio metric, defined as the present value of benefits less the present value of operating costs, divided by the present value of capital expenditure. The benefit cost ratio is therefore a measure of net benefit to society derived from the capital investment in the project

As per Transport for NSW guidelines for transport economic appraisal, the cost benefit analysis for WestConnex includes all cumulative travel time benefits attributable to Sydney travellers (including those travel time savings below 5 minutes per trip). The economic appraisal includes a sensitivity test with reduced user benefits (10 per cent below those estimated for the central case), which shows that the project is still economically viable, with a benefit cost ratio of 1.5 (1.7 with wider economic impacts).

Travel time benefits for the car-business (and other vehicle/user classes) are reflective of forecast travel savings from the strategic transport model (WestConnex Road Traffic Model); and of the Transport for NSW parameters for 'value of travel time savings' (VTTS) that have been applied in the analysis.

The sensitivity analysis includes a test with increased CAPEX and OPEX of 30 per cent over the risk adjusted cost estimates. The analysis demonstrates a very strong economic case for investment, even under this significantly increased cost scenario.

The *WestConnex Full Scheme: Economic Appraisal* (KPMG, 2015) provides additional information on the analysis approach and can be located on the WestConnex website (www.westconnex.com.au)

The East-West Link including the benefit cost ratio of this project is beyond the scope of this EIS.

5.3.10 Timing and need for other WestConnex components

2,760 submitters raised issues regarding the timing of other components of WestConnex

Issue description – reliance on other WestConnex components

Submissions raised concern regarding reliance on other WestConnex components including Stage 3 for the New M5 to be successful. Specific concerns are listed below:

- Concerns raised were associated with the reliance of the New M5 on construction of other unfunded and unplanned toll road projects, including the completion of the entire 33 kilometre project
- The Australian and NSW Governments have only put in enough money to fund WestConnex Stage 1 and Stage 2 (the latter by means of a loan from Commonwealth to State). Stage 3 is currently unfunded. There is a funding shortfall of over $10 billion to complete WestConnex
- The New M5 is reliant on the M4–M5 link from Haberfield to St Peters which is only 'undergoing concept development and subject to planning approval' and no details of Stage 3 are included in the EIS
- Stage 3 of WestConnex (M4-M5 Link) is not planned to be completed until 2023 and is predicated on the sale of Stage 1 and Stage 2 and the imposition of high toll fees for decades
- The argument for WestConnex depends on completing the whole motorway, including Stage 3
- Including the M4–M5 Link in the 'do something (2031)' scenario is of concern as in this time period there may be a change of government which would affect the process
- The 'do something (2031)' scenario, stated in the EIS, also depends on an unplanned harbour crossing
- It is reckless for the Government to embark on building individual stages of WestConnex without assured finance to complete the whole project. The project should be put on hold until it can demonstrate it has the funds to complete it. It is likely therefore that taxpayers would have to subsidise WestConnex for over half a billion dollars per annum into the foreseeable future
- The environmental impacts of the M4—M5 Link would be more significant than for the New M5
- Traffic congestion issues in local inner west suburbs would be caused by the completion of the New M5 without the completion of Stage 3 works. This would include around the St Peters interchange and King Street
- Concern that the project would move the bottleneck to other locations
- The associated social and environmental cost to suburbs such as St Peters, including loss of peoples' homes with inadequate financial compensation, demolition of heritage buildings, acquisition of businesses, impacts on the suburban landscape, increased air and noise pollution and a decrease in local amenity
- The M4-M5 Link would likely not proceed or be approved by the planning authority.

Submissions were not convinced about the likely completion of these other stages of work which may be affected by economic and political constraints, such as the potential financial failure of proceeding stages and lower than expected toll revenues (which were to provide funding for next stages).

Based on these concerns submissions questioned what would happen if these other projects do not proceed. Submissions noted that the impact of other WestConnex projects not proceeding may result in inner city suburbs experiencing increased traffic volumes on local streets in the absence of planned diversions that have not eventuated and residents subject to unacceptable levels of dangerous pollution and destruction of their amenity. This EIS makes no attempt to assess the impacts of other projects not going ahead.

Submissions also raised concerns regarding the following:

- There is no declared time frame for Stage 3
- No details have been released on the route of the M4-M5 Link and how it would affect suburbs

- WestConnex authorities have consistently stated that the goal of the project is to provide a route from the west to Port Botany and Sydney Airport. However the integral route to allow this to occur is Stage 3 of the project
- In the absence of the development of the full WestConnex program of works, Sydney Gateway and the Southern Connector, additional network upgrades would be required to accommodate the 2031 'with project' traffic demand in the St Peters interchange area.

Response

The primary objective of the project is to increase capacity and alleviate congestion along the M5 Motorway corridor, leading to a more efficient motorway connection between south west Sydney and Sydney Airport/ Port Botany for key user groups. By achieving this intent, the project would increase connectivity between south west Sydney and Sydney's Global Economic Corridor.

The New M5 would provide commuters from south western Sydney with direct connectivity to the employment zones to the north and west of the Sydney Airport / Port Botany precinct, and access to Sydney Airport via upgraded local roads in the short term, as well as future connectivity to the future Sydney Gateway. The New M5 would also allow redistribution of vehicles from the existing M5 East Motorway, particularly those commuters connecting to the CBD and the inner west of Sydney, rather than proceeding through the port / airport precinct. This redistribution of traffic aligned with commuter destinations would contribute to easing congestion along the M5 East Motorway. By easing congestion along the M5 East Motorway, the New M5 would enhance connectivity for commuters using the M5 East Motorway to access employment centres along the M5 corridor, including the port / airport precinct.

The importance of the M4–M5 Link in achieving all of the broader WestConnex strategic objectives is recognised in the EIS. This is reflected in the traffic impact assessment carried out for the project, which identified that additional road network augmentation beyond completion of the New M5 would be required by around 2031.

At this time, traffic forecasting indicates unacceptably low levels of road network performance based on available network capacity (including completion of the New M5) and continued growth in traffic demand. The NSW Government has identified the WestConnex Stage 3 (M4–M5 Link) as the project to provide additional road network capacity and an application for approval of this project has been lodged with the Department of Planning and Environment. An EIS for the M4–M5 Link would be prepared and publicly exhibited for comment in the future. Should the M4–M5 Link not proceed, traffic forecasts indicate that additional upgrades would be required by around 2031 to avoid unacceptable deterioration in road network performance.

The EIS acknowledges that other WestConnex projects including the M4-M5 Link are needed to deliver a number of project benefits. However, Section 1.4 of the EIS also identifies the project benefits that would be delivered by the project alone and in combination with the King Georges Road Interchange Upgrade, which is currently under construction.

The New M5 project would:

- Provide additional motorway capacity along the main connection to Sydney Airport, Port Botany and south west 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.

Together with the Southern Connector, the project would:

- Support the economic development of Sydney by providing a high quality and efficient road connection for motorists and freight vehicles between the Global Economic Corridor and Global Sydney (as defined in *A Plan for Growing Sydney* (NSW Government 2014)

- Provide additional capacity to address existing traffic congestion on the M5 East Motorway and local roads by separating longer distance through traffic from local traffic. Current traffic congestion is causing poor amenity along the M5 corridor and constraining the operation of existing businesses and efficient movement of freight
- Provide better connectivity between local centres adjacent along the M5 East Motorway corridor
- Facilitate urban renewal in precincts adjoining the M5 East Motorway corridor by improving local amenity with less traffic noise and vehicle emissions from congested traffic.

Local Road Upgrades

Around St Peters traffic volumes on key local roads are generally expected to increase due to projected population growth in the area. Intersection performance along local roads around St Peters interchange would also deteriorate as a result of the associated traffic growth.

Without the local road upgrades and the WestConnex project, this forecast growth in traffic around St Peters would cause congestion and bottlenecking, with the network unable to accommodate the expected demand. By 2031, motorists travelling in the afternoon peak would experience significant congestion compared to today. This is forecast to result in a 67 per cent increase in travel times, a 40 per cent decrease in speeds and increasing delays at some intersections.

The St Peters interchange would be built on the Alexandria Landfill site at St Peters. The new interchange would connect the New M5 to St Peters and Mascot and would provide future connections to the M4-M5 Link and Sydney Gateway. When WestConnex is completed, motorists would be able to choose to stay on the New M5 for a direct connection to the M4 Motorway corridor or come up to the surface at St Peters.

On the surface, motorists would have four routes to choose from including:

- Continuing on to Euston Road, which would also take motorists to Alexandria
- Extending Campbell Road across Alexandra Canal providing a new local connection to Mascot town centre for motorists, pedestrians and cyclists
- A new direct connection to Mascot via Gardeners Road
- Campbell Street/Road, for local access to St Peters. The St Peters Interchange would also link with the proposed Sydney Gateway and the future connection to the M4-M5 Link.

The extension of Campbell Road to create a new crossing of Alexandra Canal would also reduce the number of cars using Huntley Street or fighting to cross the canal at the Ricketty Street Bridge, fixing this traffic bottleneck for motorists.

These upgrades to local roads around St Peters would provide the necessary additional capacity in the local road network to provide strong connections to areas such as Mascot, Marrickville, Alexandria and Green Square, accommodating forecast background traffic growth and the predicted traffic which would use the St Peters interchange.

Along King Street, through traffic which currently uses this road would have an underground bypass once the M4-M5 Link is completed. Also, when upgraded, Campbell Street, Campbell Road and Euston Road would provide an alternative to Sydney Park Road, Princes Highway and King Street, which would assist in alleviating traffic congestion along King Street in the peak-flow direction.

Project funding

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 are being established for the delivery of each stage of WestConnex, and these 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, there is no Government guarantee. This structure supports future sell-down to the private sector.

A full financial appraisal for the project is presented in the Updated 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 overall cash flow has been calculated using a combination of capital costs, recurrent costs and tolling revenues. The financial appraisal concluded that the proceeds from the sale of the initial investments would be sufficient to cover the costs for Stage 3 (the M4–M5 Link).

The financing strategy for the M4–M5 Link does not rely on the sale proceeds from Stage 1 and Stage 2 of WestConnex alone.

5.3.11 Operational costs of project

Four submitters raised issues regarding the operational costs of the project.

Issue description – ongoing building and maintenance costs

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

- Ongoing operational costs are significant and unlikely to be covered by tolls
- Recurrent operational / lifetime costs (maintenance, repairs, resurfacing, ventilation systems signalling systems) are not presented in the EIS

Response

As stated in the Updated Strategic Business Case, the economic appraisal relies on estimates of the operating and maintenance costs associated with the project scenario. As described in the Updated Strategic Business Case, annual operating and maintenance cost estimates were developed by Rider Levett Bucknall Pty Ltd and provided to KPMG by the WestConnex Delivery Authority for the purposes of the economic appraisal.

The economic appraisal is based on NSW Treasury's TPP07-4 Guidelines for Financial Appraisal and TPP08-05 Guidelines for Capital Business Cases. The purpose of the appraisal is to summarise the costs and revenues associated with the project, and hence determine the net present value to the NSW Government of developing the project.

A discounted cashflow financial model has been developed for WestConnex that captures the construction and operating period cost and revenue assumptions for the individual stages, and presents the net cashflows to the end of the analysis period (31 December 2060). This approach reflects a typical cashflow analysis methodology for the assessment of toll road projects. The financial model presents all cashflows on a nominal basis over the evaluation period.

Operational and maintenance costs have been modelled on a quarterly basis and then aggregated to annual cashflows. 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, presented in Section 12.6.2 of the WestConnex Updated Strategic Business Case, showed that WestConnex remains economically viable against potential cost increases of up to 30 per cent to both capital and operating costs, reducing the benefit cost ratio to 1.5 (with wider economic impacts), which is still considered a very positive benefit cost ratio.

The economic analysis found that WestConnex, including the New M5 project, would create benefits that would outweigh the initial upfront construction cost and ongoing operational costs.

5.4 Project development and alternatives

5.4.1 Options development

22 submitters raised issues regarding the development of project options

Issue description – connectivity around the St Peters interchange

Submissions raised concerns about and questioned the connections that St Peters interchange would provide to the local road network, Sydney Airport and Port Botany. With regards to connectivity to the local road network, submissions raised the following issues:

- Objection to the connections to Campbell Road, Euston Road and Gardeners Road from the St Peters interchange
- Suggestions that Bourke Road should be used instead of Euston Road to provide direct connections from St Peters interchange to Port Botany and the M1 Motorway
- Concerns that the St Peters interchange would not provide the required connectivity to Sydney Airport and Port Botany
- The Euston Road connection should be redirected further east towards the Alexandria Canal or beyond to protect trees along Sydney Park.

Response

Connections to the local road network

The configuration of the St Peters interchange was designed to provide an integrated connection to local and regional road networks, to nearby areas of future projected population and employment growth, and direct connections between:

- The New M5 and the future Sydney Gateway
- The future M4–M5 Link and the future Sydney Gateway
- The local road network and the future M4–M5 Link
- The local road network and the future Sydney Gateway.

Various options for connecting the New M5 to arterial and local roads around St Peters interchange were considered prior to the proposed arrangement being selected. The options were investigated to identify roads that best met the interchange connectivity objectives, which are provided in Section 4.4.4 of the EIS.

The Princes Highway, Euston Road and Burrows Road were investigated as potential north-south local road connections to St Peters interchange. Campbell Street and Canal Road were investigated as potential east-west local road connections.

Burrows Road was considered unsuitable as a north-south connection to St Peters interchange as the use of this road would require the acquisition of a large number of industrial and commercial properties along Burrows Road, and would have considerable impacts to the road network during construction. The Princes Highway was also considered unsuitable due to the commercial, industrial and residential property acquisition that would be required and the potential impacts that construction works would have on the road network performance, which is already heavily congested during peak periods.

Canal Road was considered unsuitable as an east-west connection from St Peters interchange to the local road network as the upgrades to this road would have significant impacts on the container terminal and adjacent commercial and industrial properties which would impact on the economic productivity in Sydney.

The connection to Campbell Road / Campbell Street would provide an opportunity to service traffic travelling to and from surrounding suburbs. The Campbell Road / Campbell Street upgrades would support this connection by providing significant additional through capacity, removing possible incentive for vehicles to use other local roads. The connection would also improve local amenity by providing an alternative route around Sydney Park that would take existing traffic away from the residential – open space interface to better connect the community to Sydney Park.

In addition to the Campbell Road connection, a new east-west connection would be provided to Gardeners Road via the proposed Gardeners Road Bridge. Gardeners Road is one of only a few east – west link roads in the inner south that cross the Eastern Distributor and connect to other north –

south arterial roads including O'Riordan Street, Botany Road and Anzac Parade. This makes it an important connecting route between the inner south and eastern suburbs.

Connection via Euston Road instead of alternative routes

As described in Section 4.4.4 of the EIS, Euston Road was identified as an important point of connection with the St Peters interchange via the on and off ramps at the eastern end of the main alignment tunnels as it provides a connection to areas of residential growth and the precincts around Alexandria. Also of strategic importance is that in its modified format Euston Road is able to be contained within an existing road reserve that extends north from the St Peters interchange. The use of this existing road reserve constrains the potential impacts widening of this road would have on adjacent receivers and Sydney Park otherwise. An alternative alignment in a similar location would require additional property acquisition and / or increased impacts on Sydney Park.

The EIS acknowledges that widening of Euston Road would require that the existing trees along the interface between Euston Road and Sydney Park would need to be removed. Landscape character and visual impacts resulting from the removal of these trees would be managed via the proposed landscape character design for this location which would be documented within the final Urban Design and Landscape Plan for the project.

Most of the land adjacent to Euston Road upgrade works is zoned for and currently occupied by industrial developments and public open space. A short section of land, on the western side of Euston Road between Sydney Park Road and Maddox Street, is occupied by medium density residential development. This residential development is separated from the existing carriageway of Euston Road by land reserved for acquisition under the *Sydney Local Environmental Plan 2012* and protected through the development setback provisions detailed in the *Sydney Development Control Plan 2012*. The reserved land has been historically protected in anticipation of the need to widen this part of Euston Road. Therefore, a main traffic route servicing project traffic would be located adjacent to industrial rather than residential development. The combination of Campbell and Euston Roads would further reinforce this by diverting existing and background traffic from Princes Highway / Sydney Park Road to the widened roads, improving amenity and connection for residents to the park.

An upgrade to Bourke Road instead of Euston Road would be undesirable as there would be significant design restrictions in connecting the interchange to Bourke Road across the Alexandria Canal this option would require a much more significant bridge crossing than is currently proposed. Additionally, the use of Bourke Road would require significant property acquisition to enable the widening works that would be needed to meet the upgraded capacity requirements.

Euston Road provides connections to Green Square and other precincts projected to have high population growth around Alexandria. Although connections to Euston Road from the St Peters interchange would still result in some disruptions during construction, the proposed upgrades required to accommodate traffic exiting the main alignment tunnels at the St Peters interchange could be largely contained within an existing road reserve that extends northwards from the St Peters interchange. As such, Euston Road was selected as the preferred north-south connection.

Connections to Sydney Airport / Port Botany

The proposed Gardeners Road extension and Campbell Road extension would assist in providing additional connections to Sydney Airport and Port Botany via existing major arterials such as O'Riordan Street and Botany Road. In addition, the future Sydney Gateway project would provide a direct connection to the Sydney Airport / Port Botany precinct via a new road from St Peters interchange.

The connections that would be provided by the project have also been designed to align with ongoing Roads and Maritime commitments to improving connectivity to Sydney Airport including via the Airport North Precinct. Works associated with the Airport North Precinct are outside the scope of this EIS and would be undertaken by Roads and Maritime under a separate approval(s).

Issue description – consideration of previous studies

Submissions suggested that the EIS should consider the previous M5 duplication proposal by the then Roads and Traffic Authority (now Roads and Maritime) (November 2009), which is a more

modest proposal and costs less. Neither the M5 duplication proposal nor the Kyeemagh-Chullora Road Inquiry were properly presented or mentioned as alternatives to the project.

Response

The M5 Transport Corridor Feasibility Study (Roads and Traffic Authority, 2009) investigated a number of alternative options to alleviate congestion and improve amenity along the M5 East Motorway and the surrounding road network. The study presented the outcomes of various investigations carried out as part of the development, assessment and evaluation of strategic options for improving the M5 Motorway corridor and identified a preliminary preferred option which was the M5 East Duplication. The report outlined a strategic concept for the identified preliminary preferred option. The presented strategic concept was a high level design and was intended to inform further engineering investigation, consultation and environmental assessment,

The strategic concept was later used to inform the motorway options development for the current New M5 project, forming the basis of the southern alignment in the early options development. The feasibility study forms part of the early investigations for the project and as such cannot be considered a strategic alternative to the project.

The Kyeemagh-Chullora Road Inquiry was conducted as a Commission of Inquiry by David Kirby into the potential development of a major road connecting Port Botany with the industrial areas in Western Sydney. The Inquiry, and subsequent Inquiry report, were conducted in 1979-1980 and considered whether a major road was needed at the time, the potential impacts of such a road, the preferred route for the road if it were needed, and other transport alternatives. The potential major road link contemplated by the Inquiry has since been constructed in the form of the existing M5 Motorway (including the more recent addition of the M5 East Motorway). Although many of the broad concepts canvassed in the Inquiry report remain relevant to the consideration of transport infrastructure to service Sydney, most of the detail in the Inquiry report has now been superseded by the passage of time and construction of transport infrastructure over the course of more than three decades since publication of the Inquiry report.

5.4.2 Preferred tender design refinements

59 submitters raised issues regarding refinements to the preferred tender design.

Issue description – M5 linear park and M5 East Green Link

Submissions requested that the M5 Linear Park be extended from Bexley North through to Tempe to provide for a pedestrian / cycle connection between Riverwood and the city (also known as Green Link).

Response

The project does not propose to construct surface infrastructure between the western and eastern tunnel portals. Existing cycle links are provided along the local street network in this area and would continue to function for this purpose during construction and operation.

Extending the existing cycleway along Wolli Creek Valley to connect the western and eastern cycle infrastructure was investigated as part of the M5 East Motorway project. The investigation identified that a cycleway at this location would be constrained and would require additional land acquisition.

The project would enhance cycling infrastructure and connectivity at the western and eastern ends of the project (refer to **Section 5.8.11** of this report).

Issue description – additional connections around Marsh Street

Submissions suggested an alternative design involving:

- Terminating the exiting M5 motorway in Arncliffe with all traffic entering / exiting at Marsh Street
- Connecting the new M5 Motorway to the existing airport tunnel
- Connect the existing M5 Motorway and the airport tunnel to the future F6 via portals.

Response

The additional connections around Marsh Street proposed within the submissions would require the construction of a Marsh Street interchange. The potential for an interchange at Marsh Street was investigated during the preliminary corridor feasibility studies. An interchange at this location was not considered to be feasible as it would result in significant impacts to the surrounding network performance and would encroach on sensitive wetland habitat at Marsh Street / Eve Street.

A detailed discussion of the eastern interchange location options assessment is provided in Section 5.4.1 of the EIS.

The preferred tender design provides for the connection to the possible future Southern Connector (F6) with stub tunnels at Arncliffe near the Kogarah Golf Course.

Issue description – retention of trees

Submissions recommended that the paperbark and Port Jackson fig trees on Campbell Street and Euston Road be retained.

Response

The removal of the trees along Euston Road is required to facilitate local road upgrades. Removal of a small number of trees along the Sydney Park side of Campbell road would also be required. Local road upgrades are required to ensure safe and efficient connections with the New M5, and to cater for additional traffic demands.

The design of local road upgrades aims to create a series of tree lined streets for local residents and users of the area and to integrate the local streetscape with adjacent open space and parkland, particularly in the vicinity of Sydney Park (refer to the Urban Design Report in Appendix L of the EIS). Tree and landscape planting would be designed to match City of Sydney Council guidelines. Street tree plantings along Euston Road would comprise native species and would aim to complement and reinforce the Melaleuca plantings present within and in the vicinity of Sydney Park.

During detailed design, lane widths and the potential removal of the central turning lane on Euston Road would be reviewed with an aim to reducing the road width to minimise impacts to Sydney Park including loss of park space and vegetation and facilitate additional landscape treatments.

Issue description – stormwater basin fencing

Submissions recommended that fencing proposed around the stormwater basin at Camdenville Park should be undertaken in accordance with the proposal by Marrickville Council by using a strategically placed fencing solution, vegetation and tree plantings.

Response

The project would result in temporary and permanent acquisition of Camdenville Park. Permanent acquisition would be required to facilitate local road upgrade works on the May Street, Campbell Street intersection. A portion of the park would be temporarily acquired to upgrade the stormwater drainage basin within the park to accommodate the increase in impervious surfaces as a result of the project.

At completion of construction, the park would be re-instated and landscaped in accordance with the commitments made in the EIS. The framework would be delivered through a landscape and urban design plan which would be prepared in consultation with Marrickville council and with reference to the Camdenville Park Masterplan.

Issue description – alterations around May Street

Submissions suggested an alternative design involving:

- Retain the traffic arrangements at May Street (i.e. left / right out and in), as this street is already dominated by light industry. This would limit and spread the additional noise/traffic impacts on local streets as a result of the New M5. The proposal to change May Street into left in/out only should not be progressed

- The May St / Princes Highway intersection should not be left only, as local traffic from Brown, Florence etc. (now unable to turn right onto Campbell Street) will not be able to access the New M5 or the highway
- The clearway from the May Street / Bedwin Street intersection should be as short as possible to enable greater car parking
- Propose the inclusion of angle parking on May Street at the north end of Camdenville Park to increase the parking spaces lost from the south side
- Propose to relocate the painted traffic chicanes closer to the May, Bedwin, Campbell Street intersection to the western side of the Camdenville Park council maintenance access road, west of 119 May Street and adjacent to the stormwater basin
- Suggest the speed of traffic along May Street be reduced to 40 kilometres per hour due to the size of road, likely increase in volume of traffic and due to the close vicinity to Camdenville Park
- Suggest that May Street speed limit is maintained at 50 kilometres per hour
- Suggest a dedicated third lane heading eastbound on May Street, to accommodate vehicles turning right, allowing two clear lanes to continue with the left hand turn onto the Princes Highway, could be achieved by removing five car parking spaces outside of the units on the corner of May Street and Princes Highway
- Propose to extend footpath upgrades in front of the local significant heritage items (LEP I273), terraces on May Street, and include narrow raised garden beds are integrated into the footpath (on the road side)
- Suggest use low maintenance, low height water tolerant shrubs/grasses to ensure drivers' views are not obstructed and also complying with Marrickville Council planting policies
- Suggest that May Street becomes one way.

Response

The May Street / Princes Highway intersection is outside of the scope of this project. The project does not propose to alter the existing traffic arrangements at this intersection.

The traffic model used to inform the EIS identified that in future years additional measures may be required at this intersection to maintain appropriate network performance. These works would form part of the King Street Gateway project and would be subject to a merits-based assessment, including undertaking traffic modelling and a full analysis of access and parking implications, as well as liaison with all relevant stakeholders and a detailed cost benefit analysis.

Issue description – alterations around Campbell Street

Submissions suggested an alternative design, consisting of:

- A request that the right hand turn bay on Campbell Street is lengthened and the median on Campbell Street is removed to make room for a longer bay
- Alternatively, a request that the right turn access from Campbell Street into Hutchinson Street is removed, allowing only left-turn access from May Street and Campbell Street
- A suggestion that the traffic signals on Campbell Street be moved to Florence Street, which would allow local traffic to turn right onto Campbell Street from Silver / Florence streets, providing for access for local residents on Silver Street, Florence Street and Brown Street
- A suggestion that a side street parallel to Campbell Street on the southern side be added so that access from Brown Street and Florence Street to the proposed traffic lights on St Peters Street is improved
- Consider keeping the road alignment straight for Campbell Road between Burrows Road and Euston Road which would have the effect of moving the upgraded Campbell Road in this location (with additional turning lanes) away from the front of the heritage houses

- Suggest that the intersection arrangement at Princes Highway / Campbell Street is retained to allow traffic from the New M5 to cross the highway to travel west on Campbell Street, but limit other movements into Campbell Street to limit (albeit minor) the volume of additional traffic on this street
- Campbell Road should be turned into a local access road with sound barrier (between existing Campbell Road and St Peters interchange exit road) to border the southern boundary of Sydney Park, incorporating an additional 3m of green space buffering Campbell Road from St Peters interchange. A second road should instead be built along the trajectory of Campbell Road (leaving Campbell Road as an access road for park users and residents) creating a buffer between terrace houses.

Response

The widening of Campbell Street / Campbell Road and modified turning provisions at Hutchinson Street (resulting in left-in one way arrangements from Campbell Street) have been designed to ensure pedestrian safety, manage potential delays which would impede pedestrian connectivity and deliver the necessary road infrastructure to safely and efficiently manage the forecast traffic volumes.

The right hand turn bay from Campbell Street to May Street has been designed to a length that meets the requirements for the forecast demand and the Austroads Guide to Road Design.

Traffic signals have been provided on Campbell Street to cater for all turning movements to and from St Peters Street. This would allow for vehicles wishing to access St Peters Public School via St Peters Street whilst maintaining appropriate network performance along Campbell Road. Alternative access to Campbell Street eastbound from Brown Street, Silver Street and Florence Street at St Peters would be available via Unwins Bridge Road.

Where feasible, the project has been designed to locate new road infrastructure on the south-western side of Campbell Road / Campbell Street to minimise impacts on residential areas on the northern/eastern side of these streets, as well as to stay within the existing road reservation. Acquisition of private properties on the northern side of Campbell Road to facilitate the road widening would not be required. A shared path has been provided between these properties and the upgraded road to maximise the distance between residences and traffic lanes. Landscaping to further reduce impacts to the properties would be considered during detailed design.

Consideration of turning Campbell Road into a 'local road' and including parallel roads along Campbell Road / Campbell Street were not considered due to the likelihood that further acquisition would have been required. Additionally the majority of works currently proposed would occur in the existing road reserve.

The provision of movements from the Princes Highway to Campbell Street westbound has been included in the design to provide the required local connectivity to maintain network performance. Further, the movements would remove the existing rat run of vehicles from the Princes Highway through the narrow local streets of Victoria Street and Church Street to get to Campbell Street because of the existing banned left turn at the Princes Highway / Campbell Street intersection. Campbell Street would be upgraded to maintain an appropriate level of service with the inclusion of additional traffic from the project and the Princes Highway.

Issue description – pedestrian bridge across Campbell Street

Submissions recommended that the proposed twin pedestrian bridge across Campbell Street should be divided into two separate bridges with one located at the northern end and one located at the southern end of the M4–M5 work area.

Response

The Campbell Street pedestrian and cycle bridge would extend from the Bourke Road and Bourke Street cycle paths to Sydney Park and across Campbell Street. The bridge would be delivered as part of a broader series of works to improve pedestrian and cyclist accessibility around Sydney Park. The location of the bridge was designed to connect with existing pedestrian / cyclist infrastructure within Sydney Park and avoid conflicts with the proposed City Farm development within Sydney Park. Additionally the provision of two bridges would require a greater volume of land acquisition within the park.

Additional at grade signalised crossings across Campbell Street would be provided at the Albert Street / Campbell Street intersection and the Euston Road / Campbell Street intersection. These crossings would provide additional at-grade connectivity and permeability for pedestrians and cyclists on the southern edge of Sydney Park.

Issue description – Unwins Bridge Road

Submissions suggested an alternative design involving:

- Right hand turns onto Unwins Bridge Road will be necessary in both construction and operation.
- The right hand turn from Conway Place to Unwins Bridge Road must be permitted in the operational state for local access.

Response

The project would maintain the right hand turn into Unwins Bridge Road during both construction and operation.

The right hand turn from Conway Place to Unwins Bridge Road would be maintained during operation.

Issue description – Sydney Park Road access

Submissions recommended that the existing right hand turn from Mitchell Road to Sydney Park Road be retained.

Response

The project does not propose to alter the existing arrangement of the Mitchell Road / Sydney Park Road intersection. The traffic model identified that in future years additional measures may be required at this intersection to maintain appropriate network performance. Roads and Maritime would monitor the traffic movements at this location closely upon opening of the New M5 and if required, and subject to the successful outcome of further consultation with the local councils, stakeholders and community, plan to implement localised schemes.

Issue description – Additional connections around Kingsgrove Road

Submissions recommended that a cycle bridge be installed adjacent to the existing M5 overpass in a similar fashion to the bridge over James Ruse Drive next to the M4.

Response

The project does not propose any modifications to the cycle infrastructure at the Kingsgrove Road interchange. At present accessibility between the northern and southern shared paths of the M5 Linear Park is provided through shared paths on both the western and eastern sides of Kingsgrove Road. These paths are supported by a signalised crossing under the M5 Motorway overpass that provides safe accessibility for cyclists crossing Kingsgrove Road. Based on the existing topography, a dedicated cyclist overpass is not considered feasible due to the scale and built form required for such structure to meet acceptable gradients and clearances of existing roadways. The project would maintain the existing cycling connectivity along the M5 Linear Park.

Issue description – Bedwin Street Bridge

Submissions recommended that work should include some safety measures on Bedwin Street Bridge (over the railway). Barriers between pedestrians and four lanes of heavy traffic need to be implemented as a priority.

Response

The project does not propose any modifications to the Bedwin Street Bridge. No changes are proposed to the operation and functionality of pedestrian facilities along the Bedwin Road Bridge. As such, there is not anticipated to be any increased risk to the safety of pedestrians from the operation of the project.

Issue description – Campbell Road Bridge

Submissions suggested that Campbell Road Bridge is unnecessary and should be removed from the scope of the project. This should instead be a pedestrian and bicycle bridge.

Response

As part of the environmental impact assessment, the following scenarios for the provision of the Campbell Road Bridge has been investigated for 2021 and 2031 traffic:

- No bridge on Campbell Road
- A two lane bridge on Campbell Road (one lane each way)
- A four lane bridge on Campbell Road (two lane each way).

The investigation considered the impact to the local road network in terms of queueing, flow capacity and performance of the nearby intersections. It was found that with a two lane bridge:

- The traffic would reroute via Gardeners Road and causes the level of service of the intersections along this route (Campbell Road/Bourke Road and Gardeners Road/Bourke Road) to reduce below the acceptable level
- There would be an increase in queue lengths on the eastern and western approaches of Gardeners Road / Bourke Road and the northern and western arm of the Campbell Road / Bourke Road intersection.

For 'No Bridge' on Campbell Road, the following would result on top of the impact of a narrower bridge described above:

- All local traffic would need to use Ricketty Street Bridge as there would be no access via the Gardeners Road ramps. The traffic on the roads along this link (Burrows Road, Kent Road, Canal Road and Gardeners Road West) would be significantly increased

The project therefore proposed a four lane bridge on Campbell Road. Traffic that would be using the new bridge has been estimated and their movement modelled. It was found that with the proposed widening of the local roads, the intersection performance and queuing on the related local roads are acceptable.

Issue description – incorporation of cycling and walking paths

Submissions suggested an alternative design, including:

- The project does not provide inter-regional cycling links and infrastructure
- Requests that a cycle path should be incorporated into the design
- Improvements to walking and cycling should be made along the entire route as was provided for the Westlink M7 Motorway
- The project should include a separated cycleway including grade separated overpasses of King Georges Road and Bexley Road and all roads in between
- The project should include improvements in the width and route of the cycleway from King Georges Road to Bexley Road
- Cycleways included in the project should plan for 20 plus years and be at least four metres wide, not 2.4 metres wide.

Response

The provision of a cycle path connecting existing cycle infrastructure at the western and eastern ends of the M5 Motorway corridor was investigated during development of the M5 East Motorway project. The construction of a full separated cycleway along the length of the corridor is not proposed as:

- The investigation identified that a cycleway at this location would be constrained and would require additional land acquisition

- Existing cycle links are provided along the local street network in this area and would continue to function for this purpose during construction and operation.

By moving through traffic into underground tunnels, WestConnex would remove traffic from local roads. This would improve local amenity and safety for cyclists and pedestrians.

A cycleway is currently provided through the M5 Linear Park from King Georges Road to Bexley Road. At the commencement of construction of the project, the shared path to the north of the M5 East Motorway would be temporarily realigned to follow the northern boundary of Beverly Grove Park. At completion of construction, the shared path would be relocated and reinstated within Beverly Grove Park.

The retained shared path between King Georges Road and Bexley Road has been designed with sufficient capacity to accommodate current and anticipated predicted cyclist numbers.

The project would deliver around 14 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.

Throughout the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. Following exhibition of the EIS and in response to submissions, additional work has been undertaken to build on the work completed to date, and to ensure pedestrian and cyclist facilities are consistent with existing State and local government policies and strategies.

At present the pedestrian and cycling network in and around St Peters is fragmented, with a number of missing links, infrastructure of varying quality and a lack of safe, convenient crossings. A summary of the key locations and how the New M5 would improve existing conditions is provided below.

Campbell Street

Campbell Street contains footpaths immediately adjacent to the northern and southern sides of the road, which are of varying quality. At present the width of these paths varies with some sections as little as 1.2 metres wide. There are no street trees or dedicated cycling facilities.

As part of the project, pedestrian footpaths would feature on both sides of the street, with consistent width and paving materials. A dedicated cycleway would be constructed on the northern side of the road and street trees would line the both sides of the street. At Simpson Park the street tree canopy would be selectively planted to ensure the existing figs within the park are featured. Both the pedestrian footpaths and cycleway would be separated from the road via a combination of street trees and landscape verges.

Euston Road

At present the pavement on the western side of Euston Road is fairly regular, however its width does not adequately accommodate a shared pedestrian and cycle zone. Street tree plantings on the western side are generally consistent and feature a mature canopy. The path on the eastern side of Euston Road is irregular in width and quality.

Project works along Euston Road would create a dedicated shared path on the western side of adequate width to accommodate both pedestrian and cycle movements. The shared path would be separated from the roadway through a landscaped verge. Through further investigation of lane widths, Roads and Maritime would determine whether elements of the existing street trees on the western side can be retained. The eastern side would include street tree plantings where possible, with the remainder of the street retaining the existing trees.

Pedestrian connectivity would be enhanced through the installation of dedicated crossings at signalised intersections, none of which exist at present.

Sydney Park Road

There is currently a pedestrian footpath on the southern side of Sydney Park Road that is of good quality. Semi mature trees currently line the street.

The project would continue the shared path of Euston Road on the southern side of Sydney Park Road up to the extent of local road upgrade works. This would complement the existing cycle route in this location and also better accommodate both pedestrian and cycle movements through increased path width. A crossing at the intersection of Sydney Park Road and Euston Road would provide a new connection for pedestrians and cyclists in this location.

Gardeners Road

The western extent of Gardeners Road currently contains footpaths of varying quality and width. Street trees line the majority of the street, however the species are varying.

Project works along Gardeners Road would upgrade the pedestrian footpaths with regular width and materials, improving the amenity and safety for pedestrians. Street trees would be included where possible, given building setback would become closer to the roadway.

Bourke Road

The section of Bourke Road between Gardeners Road and the project extension of Campbell Street features pedestrian paths of varying quality and width. The Bourke Street cycleway begins in this location, just north of the existing Thrifty car rental premises. Streets trees on the eastern side are mature, but irregular in pattern.

The most significant addition as a result of the project would be a connection between the northern and southern extents of the Bourke Street cycleway with a dedicated crossing over Gardeners Road. This would ensure that cyclists do not have to dismount and cross Gardeners Road. Pedestrian footpaths would be improved in terms of both quality and regular width, both north and south of Gardeners Road. Street tree planting would be included on both sides of the street and be regular in pattern and species selection.

New active transport infrastructure in the St Peters, Mascot and Alexandria precincts would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure. The active transport elements being provided as part of the project would also support and enable future pedestrian and cyclist connectivity opportunities. These would include:

- Providing opportunities for connection to a possible future extension of the Alexandria Canal cycleway by City of Sydney
- Design of the Alexandra Canal Bridge such that it would not preclude a future connection to a path on the western side of the Alexandria Canal
- Design to allow for future connection to active transport infrastructure associated with WestConnex Stage 3 (M4–M5 Link)
- Allowing for potential future connection to the Princes Highway from Canal Road or into bike friendly roads in lanes running parallel with Princes Highway
- Allowing for a future gateway and connector to Alexandria Canal cycleway near Tempe Reserve and further west to Cooks River cycleway (the project is a component of the overall strategic link between the inner west and the Botany Precinct)
- Offering active transport opportunities to future residential developments in the area through Euston Road improvements and improvements around Barwon Park Road
- Enabling future improvements in the Marrickville area to further integrate the network
- Enabling possible future improvement to Barwon Park Road (by reducing road use to one lane and reducing traffic volume).

Issue description – alterations around Camdenville Park

Submissions suggested that traffic calming solutions should be incorporated on either end of the park, such as a chicane at the western end of the park, with a pedestrian crossing where the current pedestrian traffic island is located.

Response

The project would not involve modifications to May Street east of around 102A May Street and does not proposed to change the current posted speed limit of 60 kilometres per hour. Additionally, no changes are proposed to the operation and functionality of pedestrian facilities along May Street. As such, there is not anticipated to be any increased risk to the safety of pedestrians from the operation of the project nor additional traffic calming solutions proposed.

Issue description – closure of King Street

Submissions suggest that King Street should be closed to all traffic except public transport.

Response

Changes to King Street, including those related to potential enhancement of public transport, are beyond the scope of the New M5 project. The project would not involve any works to King Street nor any changes to existing parking or public transport along that road.

Issue description – reduction in lanes on Princes Highway

Submissions suggest that the Princes Highway should be reduced to one lane in each direction. The remaining space could be used for additional bus lanes, cycleways, and extensions to the footpath or given over to Sydney Park.

Response

Changes to the capacity of the Princes Highway to accommodate additional bus lanes, cycleways or footpaths, or to provide additional space in Sydney Park, are beyond the scope of the New M5 project.

Issue description – inclusion of park and ride facilities

Submissions suggested that a 'park and ride' facility should be included in the project at the end of the New M5 at St Peters to enable consideration of a future fast, direct public transport link from St Peters to Sydney Airport.

Response

A public transport link from St Peters to Sydney Airport, and an associated 'park and ride' facility is outside the scope of the project.

Issue description – carpark on Campbell Street

Submissions objected to the car park on Campbell Street and suggested that a bus drop off / pick up point would be a better alternative.

Response

The car park on Campbell Street was included as part of the local road upgrade works in consultation with the St Peters Public School. The final form of the car park would be determined as part of the detailed design for the project and would involve consultation with the St Peters Public School, the Department of Education and Training and Marrickville Council.

The car park would allow safe access for users (including parents with children), and would function to provide car parking for users of Simpson Park, St Peters School and the area in general.

The indicative off street parking on Campbell Street is shown on Figure 5-31 of the EIS.

Issue description – upgrading Canal Road

Submissions questioned why Canal Road was not expanded in capacity as an alternative to upgrading Campbell Road. The submissions notes that Canal Road is an existing major traffic artery that already connects to Gardeners Road, the airport and Port Botany and would not require acquisition of parkland and residences.

Response

Bridges across the Alexandra Canal are required to service the St Peters interchange. Upgrading the Canal Road Bridge instead of utilising Campbell Street would not meet the New M5 objectives and would be undesirable as it would:

- Result in significant impacts to the road network during construction
- Not maximise connectivity of the St Peters interchange to the local road network, areas of urban growth and key desire lines for vehicles using the New M5
- Result in impacts to areas which contain key commercial and industrial sites including the adjacent container terminal
- Not provide value for money.

Issue description – provision of a pedestrian overpass at Ashmore estate

Submissions recommended that a pedestrian overpass is provided, linking the Ashmore estate and the high density residential areas of Erskineville and Newtown (for example via the planned City of Sydney 'KooKa Walk').

Response

Connectivity upgrades between the Ashmore estate and high density residential areas of Erskineville and Newtown are not within the scope of the project. The provision of new pedestrian connectivity within these areas is the responsibility of other local government and planning agencies.

Issue description – pedestrian bridge over Campbell Street

Submissions propose that a walkway bridge be built over Campbell Street at St Peters Street.

Response

Signalised pedestrian facilities would be provided at the Campbell Street / St Peters Street intersection to allow pedestrians to safely cross Campbell Street. The new signalised crossing is a significant improvement on the current zebra crossing in this vicinity. Signalised intersections provide a controlled environment under which pedestrians and cyclists can move safely between the existing and upgraded shared path network.

These facilities have been designed to meet relevant Austroads and Roads and Maritime design guidelines. The design, construction and commissioning would be subject to road safety audits prior to opening.

A bridge in this area would be unlikely to be used frequently due to the quicker, easier, safe signalised pedestrian crossing already included in this location as part of the project.

Other issues associated with building a bridge over Campbell Street in this area would include:

- The likely need to undertake further property acquisition to complete the footprint of the bridge
- The likely removal of trees within Simpson Park to complete the footprint of the bridge
- Managing vandalism and antisocial behaviour associated with such an asset.

5.4.3 Tender process and alternative tender design

Three submitters raised issues regarding the tender process and alternative design tender.

Issue description – selection of the preferred tender design

Submissions questioned how the preferred tender was selected as it varied from the original concept.

Response

The constraints identified during assessment of the early alignment options were used to inform a project corridor. The project corridor was then used as the boundary for developing a reference design ahead of the competitive tender process for the project. The reference design was a

preliminary design that was intended to inform the development of more detailed tenderers' designs. The preferred tender design was selected based on the achieved score in a number of categories including engineering design, environmental and social performance and project cost.

A description of the selection process for the preferred tender design is included in Section 4.1.3 of the EIS.

5.4.4 Selection of surface infrastructure locations

55 submitters raised alternate locations for surface infrastructure or questioned the location of facilities.

Issue description – location of ventilation facilities

Submissions relating to the selection of surface infrastructure locations raised concerns about the location of the ventilation facilities in particular those located near sensitive receivers, including residents, business and parks (including Sydney Park).

Response

The main considerations in relation to the location of ventilation facilities were minimising local and regional air quality impacts and maximising the operational efficiency of the tunnel ventilation system.

As a consequence of the longitudinal ventilation system design and the requirement for zero portal emissions (Roads and Maritime, 2014), the most efficient location for ventilation facilities is as close to the tunnel exit portals as possible.

The Kingsgrove ventilation facility would be located immediately to the south of the M5 East Motorway corridor at Kingsgrove. Locating the western ventilation facility to the south of the M5 East Motorway corridor within an established commercial and industrial area was preferred to limit potential impacts on residential dwellings to the north and south-west of the motorway.

The Arncliffe ventilation facility would be located in the south-western corner of the Kogarah Golf Course site. Situating the third ventilation facility in this location avoids the need for acquisition of private residences and minimises impacts on both the operation of Kogarah Golf Course and on the potential future development on this site.

The location of the St Peters ventilation facility within the St Peters interchange provides a ventilation facility location that would be suitable for the eastbound New M5 tunnel as well as the future eastbound M4–M5 Link tunnels. The location of the St Peters ventilation facility within the St Peters interchange also avoids the need for additional property acquisition.

A description of the options assessment for the ventilation design is provided in Section 4.6.1 of the EIS.

The air quality impact assessment, Appendix H (Technical working paper: Air Quality) of the EIS, demonstrated that emissions from the project ventilation outlets, would have no material effect on local air quality. This would be confirmed by conducting ambient air quality monitoring to demonstrate that emissions from the ventilation outlets would have no detectable impact on local air quality, including on sensitive community receptors such as residents, businesses and parks.

Issue description – location of unfiltered ventilation facilities near schools

Submissions raised concerns that the ventilation outlets would be located near specific schools including McCallum's Hill Primary, Arncliffe Primary and Haberfield Primary.

Response

Assessment of the need for and benefits of end-of-pipe pollution abatement equipment is presented in the Technical working paper: Air quality (Appendix H of the EIS, Section 11.2.2). This assessment identified that there was no beneficial impact on air quality by implementing tunnel air filtration, and the consequences for human health were not further assessed.

Only a proportion of road tunnels around the world are fitted with air treatment systems. 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 2014 Technical Paper 08 (ACTAQ 2014 TP), 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.

The Technical working paper: Air quality (Appendix H of the EIS) demonstrated that any predicted impact on local air quality as a result of the project would be very small (refer to Figures K-64, K-66, K-68, K-71, K-118, K-120, K-122, K-125 in Appendix H of the EIS). Figures K-64, K-91, K-118 and K-145 show that the contribution of emissions from the project ventilation outlets would be very small at the community receivers – which includes McCallum's Hill Primary School and Arncliffe Public School. Haberfield Primary School is not located in the study area for the New M5 and there is no potential for it to be impacted by emissions from New M5 ventilation outlets.

Including filtration would result in no material change in air quality in the surrounding community. Any predicted changes in the concentration of pollutants would be driven by changes in the surface road traffic.

5.4.5 Filtration at ventilation outlets

220 submitters raised issues regarding the ventilation outlets

Issue description – ventilation outlets

Submissions raised concerns regarding the proposed ventilation outlets, including:

- Suggesting increasing the height of the ventilation stack in Arncliffe to reduce impacts to the local area
- Concern that the proposed height of the ventilation stacks was too high
- Concern that unfiltered ventilation stacks are being used when safer filtered stacks are being used in other parts of the world.

Response

The air quality impact assessment in Appendix H of the EIS shows that the emissions from the ventilation outlet at Arncliffe are unlikely to impact local air quality and unlikely to adversely affect the health of nearby receivers.

Sensitivity tests were carried out for both the western and eastern ventilation outlets, using heights five metres above and below the heights used in the assessment, and the results are presented in Appendix H of the EIS. The sensitivity tests for a height five metres below the assessed outlets heights resulted in concentrations that were around 1.3 times greater, on average, than the sensitivity tests for a height five metres above the assessed outlets. The heights of the ventilation outlets as assessed are effective in dispersing pollutants, balanced with the adverse impact on visual amenity if the outlet heights were to be increased.

Only a proportion of road tunnels around the world are fitted with air treat systems. 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 2014 Technical Paper 08 (ACTAQ 2014 TP), National Health and Medical Research Council (NHMRC) 2008).

The provision of a tunnel filtration system does not represent a feasible and reasonable management measure and is not proposed for the New M5 project.

5.4.6 Civil Aviation Safety Authority (CASA) requirements at ventilation facilities

No submissions were categorised as having raised issues regarding CASA requirements at the ventilation facilities

5.4.7 Ventilation outlets

No submissions were categorised as having raised issues regarding the requirement for ventilation outlets.

5.4.8 Local roads design

Six submitters raised issues regarding changes to local road design.

Issue description – adequate space for road widening

Submissions raised concerns that there is not adequate space available for the widening works proposed along Euston Road and Campbell Street.

Response

The concept design for the project shows that all appropriate road design standards can be met to achieve the required traffic operational performance of Euston Road and Campbell Street within the footprint proposed in the EIS.

The space required to facilitate upgrading and widening of Euston Road is proposed to be gained through strip acquisition adjacent to the road corridor. As per the environmental management measure OpTT03 (provided in **Chapter 8** of this report), the ability to further reduce the width of Euston Road would be investigated.

Most of the land adjacent to Euston Road upgrade works is zoned for and currently occupied by industrial and public open space land uses. A short section of land, on the western side of Euston Road between Sydney Park Road and Maddox Street, is occupied by medium density residential development. This residential development is separated from the existing carriageway of Euston Road by land reserved for acquisition under the *Sydney Local Environmental Plan 2012* and protected through the development setback provisions detailed in the Sydney Development Control Plan 2012. The reserved land has been historically protected in anticipation of the need to widen this part of Euston Road.

A description of the property acquisition required for the project is included in Chapter 13 of the EIS.

5.4.9 Portal locations

Seven submitters raised issues regarding the location of tunnel portals.

Issue description – location of tunnel portals

Submissions raised issues regarding the location of the tunnel portals, including:

- Tunnel exit portal should be located in industrial zones near the airport, not next to residential areas.
- The location chosen for the St Peters interchange adjoins a heritage conservation area and would have a significant impact to nearby residential amenity. It should instead be located in the industrial estate to the east.

Response

During the development of the project a number of interchange locations were considered and assessed against the interchange objectives. Locating an interchange in the industrial zones directly north of Sydney Airport was assessed against the interchange objectives. The location would be significantly constrained by Sydney Airport to the south and Alexandria Canal to the west and was considered undesirable as it would:

- Require significant acquisition of key commercial and industrial sites
- Limit connections to key local roads including Euston Road and Campbell Road / Campbell Street for vehicles using the New M5 and wider WestConnex program of works.

5.4.10 Tunnel alignment

No submissions were categorised as having raised issues regarding the alignment of the tunnel.

5.4.11 Strategic alternatives - public transport

5,492 submitters raised issues regarding public transport as an alternative to the project.

Issue description – need to invest funding in public transport

Submissions raised concerns that funding would be better invested in public transport instead of the WestConnex program of works, including the project. Submissions raised the following issues with respect to funding public transport alternatives:

- Funding should be invested into public transport and into improving existing public transport over a being invested into a road, as it is more beneficial
- Alternatives to road transport, such as public transport (buses, light rail and ferries), freight and active transport (such as bike paths) should be prioritised, to benefit a wider cross section of the community
- Investment should be redirected to alternatives to road transport such as integrated, multi-modal transport initiatives
- Public transport is a better solution to current problems (including environmental and traffic congestion) and a more progressive approach, which is desired by the public
- Regular and reliable public transport would result in an increase in patronage
- Public transport connections to Sydney CBD and Sydney Airport should be prioritised ahead of investment in the project
- A better solution is one that directs traffic away from the city with an efficient public transport solution
- Investment in dedicated laneways or other alternatives to support bus movements on existing roads
- Investment in parking stations at public transport hubs
- Provision of Ultra PRT (Personal Rapid Transit).

Response

Section 4.2 of the EIS considered the merits of the project in the context of a range of strategic alternatives, having regard to:

- The manner in which they could achieve the project objectives
- Their performance against other transport, environmental, engineering, social and economic factors.

Section 4.2.2 of the EIS assessed Alternative 3 - Investment only in public transport and rail freight improvements.

The NSW Government is committed to investing in a range of public transport projects, as identified by the *NSW Long Term Transport Master Plan* (Transport for NSW, 2012) (the Transport Master Plan) and the *State Infrastructure Strategy 2012–2032* (Infrastructure NSW, 2012).

The Transport Master Plan provides the framework for delivering an integrated, modern and multimodal transport system by identifying NSW's transport actions and investment priorities for the next 20 years. During the development of the Transport Master Plan, all travel modes and their benefits were considered simultaneously, and land use and transport were examined together. Integrated packages of transport projects, regulations, pricing and other policy initiatives were then developed, and rigorous modelling and assessment was used to prioritise actions against objectives.

The Transport Master Plan identifies the need for progressive delivery of the WestConnex program of works. It recognises the upgrade of the M5 Motorway corridor as a key component of the

WestConnex program of works, as it would increase the corridor's capacity to accommodate commercial vehicles and freight demand. The project would help to deliver these benefits by improving the performance of the existing M5 Motorway corridor.

In assessing the need for new road infrastructure, the *State Infrastructure Strategy* (Infrastructure NSW, 2012) stated:

> *'As in other major cities, public transport is the best option for journeys to dense employment centres – such as the Sydney CBD and Parramatta. In these areas, public transport is already the preferred choice for many employees and that will continue to be the case in the future.*
>
> *However, the overwhelming majority of Sydney's journeys are dispersed in nature. For such trips the flexibility of the private car makes it the dominant choice. This 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 will change in the future.'*
>
> *It is unfortunate that roads and public transport have often been positioned as opposing alternatives competing for scarce public funding. In reality, these modes are complementary to each other, each having a valuable, but different role. The evidence is clear that private road transport is – and will 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 Government, and the expected increase in the population density of the city.'*

In the context of the Transport Master Plan and the State Infrastructure Strategy, the Government is making significant investment in both roads and public transport. These include:

- Sydney Metro City and south-west, which would extend the Sydney Metro Northwest via St Leonards and North Sydney, across the Harbour and into the Sydney CBD. From Sydney CBD, the Metro would connect to an upgraded Bankstown Rail Line
- Sydney Light Rail, including construction of a new CBD and South East Light Rail Line along the corridor between Sydney CBD and Randwick/Kingsford
- Upgrades and enhancements to the suburban rail network.

Although investment is being made in public transport infrastructure, the construction of new roads and the upgrade of existing roads in Sydney would continue to be required due to the continued demand for the diverse movements of people, goods and services across Sydney.

Issue description – assessment of public transport alternatives

Submissions raised concerns that the assessment of public transport alternatives is inadequate. In particular, the following issues with respect to the assessment of public transport alternatives were raised:

- Request to compare building the WestConnex with building more trains and light rails
- Submissions expressed concern with the independence and adequacy of the identification and assessment of strategic public transport alternatives presented in the EIS
- The EIS fails to compare this project against alternative public transport projects such Sydney's green project
- Request to re-evaluate the value for money compared to public transport options
- Modelling of increased public transport solutions has not been conducted and should include a comparison of the positive impact of which could be achieved by increased public transport together with traffic management.

Response

Table 4-2 of the EIS outlines how investment in public transport and rail freight improvements would not meet as many of the project objectives as the current project would. In particular, investment in public transport would not:

- Support Sydney's long-term economic growth through improved motorway access and connections linking Sydney's international gateways and western Sydney and places of business across the city
- Relieve road congestion so as to improve the speed, reliability and safety of travel in the M5 Motorway corridor, including parallel arterial roads
- Cater for the diverse travel demands along these corridors that are best met by road infrastructure
- Optimise user pays contributions to support funding in an affordable and equitable way.

The EIS was prepared in accordance with the relevant provisions of the 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 alternatives, including public transport alternatives has been undertaken in accordance with the SEARs and is presented in Section 4.2 of the EIS.

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 alternative/options considered, having regard to the project objectives. As such, any public transport alternatives were required to be considered in terms of the project objectives outlined in Table 4-2. Furthermore, there was no requirement in the SEARs to model the transport options provided for in the current project solely against public transport options, nor did the SEARs require any financial modelling of the project against alternative public transport options.

Neither strategic public transport or rail freight rail alternatives would completely meet the diverse range of needs for travel along the M5 Motorway corridor, and address the project objectives as outlined in Section 3.5 of the EIS. Public transport options would be feasible alternatives to the project should the objectives of the WestConnex program of works be largely concerned with transporting people to and from centres. However, the commuting demand is only a proportion of the demand along the M5 East Motorway corridor.

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.

WestConnex is a key component of the Transport Master Plan, the State Infrastructure Strategy and A Growing Sydney. The project is part of a broader integrated transport solution, the project supports a coordinated approach to the management of freight and passenger movements, as well as all modes of transport including road, rail, bus, ferries, light rail, cycling and walking.

In November 2015, the Updated Strategic Business Case was released, which provides information on the economic value of the project.

The Updated Strategic Business Case includes:

- A strategic justification for WestConnex in the context of key strategies and plans
- An updated reference design, including details of the options development process that lead to key alignment changes
- Budget and cost estimates for the whole of WestConnex
- Details of the proposed tolling regime
- Traffic demand and operational traffic modelling results, including details of travel time savings and interchange performance
- An economic appraisal, including cost benefit analysis
- A financial appraisal, including project cash flows based on the reference tolling scenario
- Details of staging, procurement and financing
- A description of the project governance model

- Details of environmental and sustainability principles
- A communications and stakeholder strategy.

The Updated Strategic Business Case includes Technical Papers providing additional detail in relation to traffic modelling, economic appraisal, updated strategic environmental review, and timeline of consultation activities.

Issue description – project will undermine use of public transport

Submissions have raised concerns that the WestConnex project will undermine the use and encouragement of public transport, by encouraging car use.

Response

Secondary vehicle travel is usually generated from new transport infrastructure such as road projects and is called induced demand. This is predicted to increase 2031 future year traffic volumes using WestConnex by between two per cent and seven per cent. Induced demand is only generated when the project and connecting roads (to the Sydney CBD etc) operate under relatively free-flowing conditions, making the 'new' trip a viable option. Moreover, the project is a tolled motorway, so induced demand would only be generated if the additional compulsory or discretionary trip provides value for money; with uncongested travel time benefits being a key factor. The predicted induced travel demand was incorporated into the WestConnex Road Traffic Model (see Section 9.1.4 of the EIS).

The traffic and transport assessment shows that in both 2021 and 2031, the forecast reduction in traffic along the M5 East would result in improved speed, journey reliability and safety in this corridor. In the St Peters area, reductions in average delay and congestion are anticipated during both future years (2021 and 2031) compared to the 'do minimum' scenarios. The operational performance of the network, including predicted traffic volumes under the 'with project' scenarios which have incorporated induced demand forecasts, is discussed in detail in Chapter 9 and Appendix G of the EIS.

The combined number of new road trips and trips redeployed from public transport as a result of the full WestConnex program of works is anticipated to be around 0.4 per cent of the total number of daily car trips on the WRTM Sydney-wide network in 2031.

As described in Section 4.2.3 of the EIS, public transport is not considered to be the sole solution to traffic issues within Sydney and along the M5 East Motorway corridor. 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.

Further, commuting demand (transporting people to and from centres of activity), makes up only a portion of the demand along the M5 Motorway corridor. The key customer markets identified for the project also includes highly dispersed and long distance passenger movements, heavy and light freight and commercial services and businesses with highly dispersed and diverse travel patterns. These key customer markers have highly varied requirements when it comes to the transfer of goods and services including the transport of containerised freight by trucks, light trucks, vans, utility vehicles and cars.

As identified in Section 4.2.3 of the EIS, public transport alternatives would only partially address these requirements and no feasible strategic transport alternatives would meet the diverse array of customer needs for travel in the M5 East Motorway corridor.

Issue description – access to Sydney Airport and Port botany by public transport

Submissions suggested that improvements to access to Sydney Airport and Port Botany should be via better integration and pricing of rail services to domestic and international terminal rail stations, having regard to the way in which the new western Sydney Airport will impact on future growth of the Sydney Airport.

Response

The passenger rail system is often congested and services can be slow and unreliable, with demand for rail services forecast to increase by 37 per cent over the next 20 years (Infrastructure NSW, 2012). The East Hills and Airport line runs largely parallel to the M5 East Motorway corridor. *Sydney's Rail*

Future (Transport for NSW, 2012) indicates that by 2031, this line would experience passenger displacement (additional passengers are unable to board the train) on much of the line between Revesby and Green Square. The Kingsgrove to Revesby Quadruplication project along the East Hills and Airport line was completed in 2013. The Quadruplication involved the construction of a second pair of tracks and associated bridge and station works to allow a physical separation of local and express services operating along the railway line.

Nonetheless, demand for rail in the Sydney metropolitan area is forecast to grow faster than operational transport demand over the next two decades (Infrastructure NSW, 2014). The State Infrastructure Strategy recognises the economic impacts and other constraints created by reduced functionality along the M5 East Motorway corridor. This corridor is important for freight and business transport, and provides connections to Global Sydney, its cultural precincts and its 'global economic corridor.' The WestConnex program of works (including the current project) is identified in the State Infrastructure Strategy as a critical program of works with a range of benefits including reduced congestion, improved access to the major international gateways of Sydney Airport Port Botany and the future proposed western Sydney Airport, as well as improved industrial and business efficiency along the M5 East Motorway corridor.

Key public passenger rail opportunities identified in the State Infrastructure Strategy and the State Infrastructure Strategy Update include:

- Progressing stage 2 of Sydney's Rail Future, including the introduction of simpler timetables across the metropolitan rail network and automatic train operations, the transition to dedicated fleet types for some lines, enhancing track infrastructure, re-design of platforms and completion of the South West Rail Link, station upgrades and the Rail Clearways Program to generate network efficiencies
- Progressing the planning and development of the Sydney rapid transit network (now Sydney Metro).

The *Sydney Airport Master Plan 2033* (Sydney Airport Corporation Limited, 2014) notes that Sydney Airport handles about half of Australia's international air freight. The total amount of freight handled at Sydney Airport is 76 per cent more than any other Australian airport. The volume of freight handled by Sydney Airport is projected to increase from 615,378 tonnes in 2012 to 1,011,312 tonnes in 2033 (Sydney Airport Corporation Limited, 2014), an increase of 164 per cent. While the Australian Government has indicated that the western Sydney Airport at Badgerys Creek may be opened in the mid-2020s, it has reiterated that Sydney Airport would continue to be the primary airport for both passengers and freight. As such, improving capacity for transport to and from Sydney Airport remains crucial, regardless of the status of the proposed future western Sydney Airport.

The strategic document *A Plan for Growing Sydney* (NSW Government, 2014) aims to promote the growth of Sydney by guiding land use planning decision-making for the next 20 years. Growing Sydney also emphasises the need to enhance capacity at Sydney's Gateways generally, which includes providing for concurrent growth at both Sydney Airport and the future western Sydney Airport.

Although investment is being made in public transport infrastructure, the construction of new roads and the upgrade of existing roads in Sydney will continue to be required due to increasing congestion and the continued demand for the diverse movements of people, goods and services across Sydney. Specifically, within the M5 Motorway corridor (comprising the M5 East Motorway and the M5 South West Motorway) public transport initiatives alone would not address growing congestion issues on rail services to the domestic and international terminal rail stations or resolve the current congestion issues along the M5 East Motorway.

5.4.12 Strategic alternatives - active transport instead of project

722 submitters raised issues regarding active transport as an alternative to the project.

Issue description – active transport alternatives

Submissions argued that investment should be redirected to improvements in active transport.

Response

Section 4.2 of the EIS describes the strategic alternatives to the project which have been considered. Alternative 3 (Section 4.2.3 of the EIS) assessed the alternative of investing only in public transport, active transport (walking and cycling) and rail freight improvements.

As stated in the EIS, journeys undertaken using active modes of transport such as walking and cycling are generally short. This correlates with the strategic intent of the NSW Government's active transport documents (*Sydney's Walking Future* (2013) and *Sydney's Cycling Future* (2013)) which aims to increase the mode share of cycling and walking in the Sydney metropolitan region for short trips (i.e. a 20 to 30 minute ride or a walk of less than two kilometres).

Active transport options, in tandem with investment in public transport, would be feasible alternatives to the project if the objectives of the full WestConnex program of works were largely centred on transporting people to and from centres. However, commuting demand makes up only a portion of the demand along the M5 East Motorway corridor. Improvements to walking and cycling infrastructure alone would therefore not meet the diverse travel demands along the M5 corridor, which are best met by road infrastructure. In addition, improvements to cycling and pedestrian infrastructure alone would not support long-term economic growth through improved motorway access or enhance the productivity of commercial and freight generating land uses.

The New M5 project includes provision of pedestrian and cyclist facilities at both the western and eastern ends, including:

- Upgrades to the existing facilities within Beverly Grove Park and along the local road upgrades
- New pedestrian and cyclist infrastructure at the eastern end of the project including a pedestrian and cyclist bridge over the Alexandra Canal to link up with the existing Bourke Street cycle path. This new link would include a direct, grade separated pedestrian and cyclist bridge across Campbell Road and into Sydney Park.

The project would make possible new and upgraded pedestrian and cyclist facilities which would deliver significant active transport benefits to the local communities. Enabling walking and cycling through upgraded or new facilities incentivises their use as a viable alternative to the use of the car for short trips, or for accessing public transport. This would assist in reducing traffic congestion on the roads around the project.

Issue description – assessment of active transport alternatives

Submissions queried whether active transport alternatives to the project had been considered.

Response

Section 4.2 of the EIS describes the strategic alternatives to the project which have been considered. Alternative 3 (Section 4.2.2 of the EIS) assessed the alternative of investing only in public transport, active transport (such as pedestrian and cycle pathways) and rail freight improvements.

5.4.13 Strategic alternatives – freight

1,028 submitters raised issues regarding freight as an alternative to the project.

Issue description – freight alternatives

Submissions relating to project development and alternatives raised the issue that the improvement of the transportation of goods via rail freight should be prioritised over transporting goods via trucks on inner city roads.

Submissions noted that by replacing road freight with rail freight there would also be potential road safety benefits.

Response

Section 4.2 of the EIS considers the merits of the project in the context of a range of alternatives, including an alternative which considers investment only in public transport and rail freight improvements.

Improvements to the rail freight network will contribute to relieving road congestion through incentivising the use of rail freight ahead of using the road network. However, Sydney's continued reliance on dispersed, point-to-point transport connections coupled with ongoing population expansion in the Sydney metropolitan area means that rail freight alternatives would not fully meet the diverse range of needs for travel along the M5 Motorway corridor, at the same time as meeting the project objectives outlined in Section 3.5 of the EIS. Section 4.2 of the EIS and the additional detail below expands on this assessment.

Sydney's freight, service and business task is large and significant. 98 per cent of containers imported through Port Botany, and more than 60 per cent of exported containers, have their destinations or origin within Greater Sydney.

Rail freight transport is more effective for long distance transport of goods to regional centres. However, Sydney's freight, service and business task requiring distribution within the Sydney metropolitan area relies on dispersed point-to-point transport connections to customers. Predominantly, freight rail serves the first leg of the freight journey, with containerised freight broken down at distribution nodes and further distributed across Sydney. In managing the freight task, heavy commercial vehicles require a primary network with high quality connections between major freight hubs, whereas light commercial vehicles depend on a multi-layered network with many connections to service more diverse and dispersed markets across Sydney.

This arrangement means that there are around four times as many light commercial vehicle trips on Sydney's road network as heavy commercial vehicle trips (Transport for NSW 2013d), and this trend is forecast to continue. A key reason for this trend is that heavy freight activity precincts are concentrated in a few key locations in the vicinity of the port and across western Sydney, and this land use pattern is also set to continue into the future.

The NSW Government is prioritising opportunities to increase the proportion of freight which is transported by rail through improved performance of the rail freight network, capacity enhancements and where necessary, the use of pricing (Transport for NSW, 2013d). However, even a doubling of the amount of container freight currently moved by rail (by 2020) would still mean that more than 70 per cent of Port Botany's projected trade would be via road. These projections solidify the requirement for investment in an efficient road network to act in tandem with port and airport precincts.

Improving connections between the Sydney airport and ports precinct and the wider Sydney motorway network has been identified as an imperative by the Government and Infrastructure NSW. Investment in additional road infrastructure, such WestConnex, would increase connections to Sydney's west, where the majority of airport and port freight traffic originates or ends.

There are significant differences between the operational requirements for bulk and container ports, and as recognised in the *NSW Freight and Ports Strategy*, the future planning for NSW ports need to be tailored for what is suitable for a particular region and port. With respect to Port Botany, this port would remain the key container port in NSW, and will continue to grow to accommodate future demand. This will be supported by transport network planning and investment. However, Port Kembla will need to play a role in accommodating the State's container trade in the future with the approved Outer Harbour Concept Plan envisioning the future construction of two separate container facilities between 2014 – 2025, and 2026 – 2037, depending on demand.

Issue description – assessment of freight alternatives

Submissions relating to project development and alternatives raised the issue that the alternative of rail freight was not adequately considered, and that transportation of goods via rail freight should be prioritised over transporting goods via trucks on inner city roads, including consideration of Port Botany. Additionally submissions suggested that project funds would be better spent on a rail link form Port Botany to western Sydney redistribution hubs, removing existing heavy transport from the roads

Response

Section 4.2 of the EIS considers the merits of the project in the context of a range of alternatives, including an alternative which considers investment in public transport and rail freight improvements.

5.4.14 Strategic alternatives – other

3,323 submitters raised issues regarding other strategic alternatives to the Project.

Issue description – desire for consideration of alternatives

A number of submissions:

- Recommended that demand management should have been considered as a viable alternative to the project
- Suggested that greater emphasis should be placed on integrated urban and transport planning, by encouraging jobs in regional centres or closer to where people live to discourage car use and to reduce the amount of time people spend commuting
- Raised concerns that the provision of new roads would not resolve issues associated with transporting people to and from areas of employment
- Recommended that the road should not be built, and that other public infrastructure should be invested in instead.

Response

Section 4.2 of the EIS considers the merits of the project in the context of a range of alternatives, including alternative 4 which considers demand management.

As noted above, the NSW Government is committed to investing in a range of public transport projects. The *NSW Long Term 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.

As noted in the 2012 State Infrastructure Strategy, 'public transport is the best option for journeys to dense employment centres – such as the Sydney CBD and Parramatta. In these areas, public transport is already the preferred choice for many employees and that would continue to be the case in the future'. However the overwhelming majority of Sydney's journeys are dispersed in nature, in particular goods and services and business travel for which commercial vans and cars are essential. Public transport and roads are complementary rather than opposing alternatives, each playing a different but valuable role in providing for the diverse transport needs of our city.

During the development of the Transport Master Plan, all travel modes and their benefits were considered simultaneously, and land use and transport were examined together. Integrated packages of transport projects, regulations, pricing and other policy initiatives were then developed, and rigorous modelling and assessment was used to prioritise actions against objectives.

As detailed in Section 4.2 of the EIS, investment in public transport and freight projects is currently occurring, however such investment is only considered successful with continued investment in roads due to the importance of roads to some industries and for people where public transport is not readily available.

As detailed in Section 3.1 of the EIS, strategic transport and land use planning in Sydney and NSW is guided by a suite of NSW Government policies, including (but not limited to):

- *NSW 2021: A Plan to Make NSW Number One* (NSW Department of Premier and Cabinet 2011) (NSW 2021)
- The State Infrastructure Strategy 2021 – 2031 (Infrastructure NSW, 2012) and the State Infrastructure Strategy Update 2014 (Infrastructure NSW, 2014)
- The Transport Master Plan
- A Plan for Growing Sydney (Growing Sydney)
- New Parramatta Road Urban Transformation Program.

As detailed in Section 3.1 of the EIS, Growing Sydney, released in December 2014, sets out the NSW Government's policy for how Sydney will grow over the next 20 years. The plan describes where people are likely to live and work, and how they will move around the city and its subregions. A key focus of the plan is delivering strong investment and jobs growth in western Sydney. This focus has seen areas such as Parramatta and Sydney Olympic Park playing larger roles in terms of job generation. The Transport Master Plan, supported by the modal specific strategies (such as Sydney's Rail Future, Sydney's Bus Future and Sydney's Light Rail Future), provides the framework for delivering an integrated, modern and multi-modal transport system by identifying NSW's transport actions and investment priorities for the next 20 years. This includes WestConnex in addition to other transport initiatives, such as the Sydney Metro and a bus rapid transit route along Parramatta Road.

Growing Sydney and the Transport Master Plan both identify the need to prioritise development of centres such as Parramatta, Penrith and Liverpool to bring jobs closer to home and areas of increasing population. However, as detailed in Section 3.3.4, while growth in western Sydney is forecast to be strong, surpassing that of the eastern half of Sydney in coming decades, it is not forecast to match the job numbers of the city's eastern half (Bureau of Transport Statistics 2014). This disparity is due to a complex mix of factors, including housing affordability, the existing employment zones and infrastructure that support stronger business investment and location decisions in the greater economic corridor and in Sydney's eastern half more generally.

As discussed in Section 3.1, while rail and public transport provide for efficient travel between major centres, there will continue to be a need for travel by road to jobs that are dispersed across the metropolitan areas and not easily accessed by public transport. In addition, commercial vehicle movements and business travel, for example to provide trade services or attend to clients, will continue to rely on the road network. The transport network will therefore need to serve a larger number of long distance trips between Sydney's west and east to accommodate population growth.

WestConnex, including the project, is a key component of an integrated transport solution and is critical to the delivery of an efficient road network that caters for the diversity and complexity of Sydney's transport user demands. The project would improve accessibility to jobs in Sydney's east, and would encourage business and industry investment, and therefore employment opportunities, in south-western centres such as Liverpool, through improved connections to other centres, allowing for the flow of people and goods.

Issue description – other alternatives

Submissions relating to project development and alternatives suggested the following strategic alternatives to achieve the project objectives or use project funding:

- Other non-specified transport alternatives to private vehicles should be considered
- Investment should be redirected to other public infrastructure projects
- Jobs and businesses should be relocated away from the CBD to reduce demand on roads into the CBD
- Private vehicles should be discouraged from travelling to the city through the implementation of taxes for congestion or other measures
- Demand management options should be implemented for roads into the CBD, including placing a toll on the existing M5
- Promotion of car sharing and congestions tax could reduce the demand on roads into the CBD
- Better local road planning is needed
- Improvements to the M5 feeder roads instead of the project, including King Georges Road, General Homes Drive and Marsh Street
- The Princes Highway should be extended and widened as an alternative to the project to provide connectivity to the city via Arncliffe and Wolli Creek.
- Consider building ring roads coupled with further developing public transport systems.
- Building a tunnel for exclusive use by trucks and industry is a better plan

- Widening of the existing M5 instead
- Funds should be invested into green space, such as Sydney Park
- Consideration of driverless vehicles in combination with advanced public transport.

Response

As noted above, the NSW Government is committed to investing in a range of public transport projects. The *NSW Long Term 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.

Consideration of the project against a range of other alternatives has been undertaken in accordance with the SEARs and is presented in Section 4.2 of the EIS.

As detailed in Section 3.1 of the EIS, strategic transport and land use planning in Sydney and NSW is guided by a suite of NSW Government policies, including (but not limited to):

- NSW 2021: A Plan to Make NSW Number One (NSW Department of Premier and Cabinet 2011) (NSW 2021)
- The State Infrastructure Strategy 2021 – 2031 (Infrastructure NSW, 2012) and the State Infrastructure Strategy Update 2014 (Infrastructure NSW, 2014)
- The Transport Master Plan
- A Plan for Growing Sydney (Growing Sydney)
- New Parramatta Road Urban Transformation Program.

As detailed in section 3.1 of the EIS, *A Plan for Growing Sydney*, released in December 2014, sets out the NSW Government's policy for how Sydney will grow over the next 20 years. The plan describes where people are likely to live and work, and how they will move around the city and its subregions. A key focus of the plan is delivering strong investment and jobs growth in western Sydney. It also recognises that the transport network between Port Botany, the major clusters of industrial land in western Sydney and destinations beyond the Sydney Metropolitan Area would see a dramatic increase in freight movements related to the expected increase in Sydney's population by more than 1.6 million people by 2031. This increased demand would need to be accommodated by both freight rail network improvements and an upgraded road network with significantly greater capacity.

The Transport Master Plan, supported by the modal specific strategies (such as Sydney's Rail Future, Sydney's Bus Future and Sydney's Light Rail Future), provides the framework for delivering an integrated, modern and multi-modal transport system by identifying NSW's transport actions and investment priorities for the next 20 years. This includes WestConnex in addition to other transport initiatives, such as the Sydney Metro.

Growing Sydney and the Transport Master Plan both identify the need to prioritise development of centres such as Parramatta, Penrith and Liverpool to bring jobs closer to home and areas of increasing population. However, as detailed in section 3.3.2, while growth in jobs in western Sydney is expected to be strong, it is not expected to match the number of new jobs forecast in the eastern half of Sydney (NSW Government, 2014). This increase in population in Sydney's west (without a similar rate of jobs growth) will significantly increase travel demand towards the east on an already constrained transport network.

As discussed in section 3.1 of the EIS, while rail and public transport provide for efficient travel between major centres, there will continue to be a need for travel by road to jobs that are dispersed across the metropolitan areas and not easily accessed by public transport. In addition, commercial vehicle movements and business travel will continue to rely on the road network. The transport network will therefore need to serve a larger number of long distance trips between Sydney's west and east to accommodate population growth.

The project would improve accessibility to jobs in Sydney's east, and would encourage business and industry investment, and therefore employment opportunities, in south-western centres such as Liverpool, through improved connections to other centres, allowing for the flow of people and goods.

Demand management was considered as alternative 4 in the assessment of strategic alternatives. Demand management can be defined as policy, planning and operational approach to the movement of goods or people. Demand management encompasses policies intended to reduce individual trips and make various mode options more viable. Types of demand management include:

- Transport pricing to reduce travel demand, including demand based, tolling or transport pricing to discourage discretionary travel by private vehicle for trips that can be served by public transport
- Implementation of taxes for congestion
- Promotion of car sharing.

Section 4.2.3 of the EIS considered demand management as an alternative to the project. Demand management measures would help to spread the demand for peak travel to less congested time periods. However, to have a major impact on road traffic, demand management measures would require considerable changes in social attitudes, travel behaviour and government policy. Therefore, while demand management could help to spread the demand for peak travel to less congested time periods, its effectiveness would be limited by other constraints, such as:

- The availability of other travel modes at the user's origin and destination
- Flexibility of working arrangements to take advantage of 'time of day' tolling or transport pricing benefits.

Improved local road planning was considered as strategic alternative 2 in Section 4.2 of the EIS. As an alternative, improvements to the arterial road network are an inadequate response to the significant transport challenges along the M5 Motorway corridor and would potentially result in significant constructability, social and environmental impacts to existing residential and commercial development along these roads. Localised road corridor improvements would only provide a relatively incremental change to the network, rather than additional capacity. For alternatives to be worthy of consideration, they must be broadly capable of accommodating the identified transport task and challenges being addressed by the WestConnex program of works. These can only be met by major arterial road improvements that would have significant construction impacts or require the construction of new infrastructure.

The provision of additional capacity to parallel arterial routes (including the Princes Highway) would generally involve removal of bottlenecks, where they may occur, and construction of additional lanes, In the case of the latter, the relatively narrow width of most parallel arterial roads would mean that additional lane capacity would require extensive land acquisition and impacts on development currently along those routes. This alternative was assessed as not providing a viable or longer term solution to the need to provide additional capacity along the M5 Motorway corridor.

Improvements to the existing M5 East Motorway through widening of the surface sections of the motorway and / or providing additional capacity within the existing tunnels were considered. Although improvements to the M5 East Motorway were deemed as possible, the improvements would be costly and highly disruptive to existing traffic during construction.

The *M5 Transport Corridor Feasibility Study* (RTA, 2009) included an assessment of the strategic merit of providing an additional truck only road tunnel. The assessment concluded that truck only tunnels would support the increased demand for freight movement. However, this alternative would not resolve growing congestion issues on the current M5 East Motorway corridor resulting from the predicted increase in commercial and private transport demand.

Investing the project funds into green space is not considered a viable alternative as it would not:

- Assist in resolving growing congestion issues along the M5 Motorway corridor
- Support Sydney's long-term economic growth, including freight movements through improved motorway access and connections linking Sydney's international gateways with western Sydney and places of business across the city.

The introduction of driverless vehicles is outside of the scope of this project.

Issue description – other alternatives not considered

Submissions relating to project development and alternatives raised the issue that other strategic alternatives to the project were not considered and should be reviewed.

Response

Section 4.2 of the EIS considered the merits of the project in the context of a range of strategic alternatives, having regard to the manner in which they could achieve the project objectives and their performance against other transport, environmental, engineering, social and economic factors.

Issue description - consideration of a combination of Alternatives 2 and 4

A submission suggested that consideration should be given to a combination of Alternative 2 (improvements to the arterial road network) and Alternative 4 (demand management measures) compared to Alternative 5 (construction of the New M5). The submission states that both alternatives and the benefits of their implementation would meet the majority of the broader project objectives.

Response

Improvements to the arterial road network (Alternative 2) are an inadequate response to the significant transport challenges along the M5 Motorway corridor and would potentially result in significant constructability, social and environmental impacts to existing residential and commercial development along these roads. Localised road corridor improvements would only provide a relatively small incremental change to the network, rather than additional capacity. For alternatives to warrant further consideration, they must be broadly capable of accommodating the identified transport task and challenges being addressed by the WestConnex program of works. These can only be met by major arterial road improvements that would have significant construction impacts or require the construction of new infrastructure. Arterial road improvement options would therefore not meet the project objectives.

Although the introduction of demand management measures (Alternative 4) would contribute to relieving congestion and would create opportunities for improved public transport initiatives, the implementation of these measures alone would not satisfy the project objectives.

Whilst a combination of these two alternatives would provide some benefit they would not:

- Support Sydney's long-term economic growth through improved motorway access and connections linking Sydney's international gateways and Western Sydney and places of business across the city
- Enhance the productivity of commercial and freight generating land uses strategically located near transport infrastructure
- Optimise user pays contributions to support funding in an affordable and equitable way.

As such, a combination of these two alternatives is not been pursued as the preferred solution.

Issue description - commercial and freight generating land uses

Submissions questioned whether a highly populated inner city area is the optimal location for some commercial and freight generating land uses. Moorebank was raised as an example of a successful alternative.

Response

The movement and rezoning of existing key commercial and freight generating land uses would result in significant disruption to the economy, environment and social network. Any such relocation would also be inconsistent with strategic land use planning direction for Sydney detailed in *A Plan for Growing Sydney* (NSW Government, 2014), including Direction 1.7: Grow Centres that provide more jobs closer to homes.

Issue description – alternative upgrades along Centenary Drive

Submissions proposed that the project take an alternative route using existing roads. This alternative design would consist of upgrading Centenary Drive, Roberts Road and King Georges Road, but would also require the M5 East to be widened to improve traffic flows. It is suggested that this upgrade would achieve the same objectives as WestConnex at significantly less cost.

Response

The suggested upgrading of Centenary Drive, Roberts Road and King Georges Road along with widening the M5 East was not considered as a reasonable or feasible design alternative to the current project. It would not meet the same performance criteria that the project is required to meet, as outlined in Chapter 4 of the EIS. In particular, this alternative suggestion would not provide the same opportunities for future connections to Sydney Airport, Port Botany and Southern Sydney, primarily as it would not include the St Peters interchange (refer section 4.5 of the EIS).

The project objectives are outlined in Section 3.5 of the EIS. The road upgrades and M5 East widening suggested in this issue description would not:

- Support Sydney's long-term economic growth through improved motorway access and connections linking Sydney's international gateways and Western Sydney and places of business across the city
- Relieve road congestion so as to improve the speed, reliability and safety of travel in the M5 Motorway corridor.

Most significantly, they would not provide for integration with other projects proposed as part of the WestConnex program of works.

5.4.15 Future proofing - tunnels (stubs caverns, tunnel excavation width)

No issues raised in community submissions were categorised under 'future proofing tunnels (stubs caverns, tunnel excavation width)'.

5.4.16 Future proofing – surface

No issues raised in community submissions were categorised under 'future proofing – surface'.

5.4.17 Property acquisition alternatives

Three submitters raised issues regarding property acquisition

Issue description – alternatives to residential property acquisition

Submissions suggested that, instead of acquiring community houses, warehouse areas around Bourke Road, O'Riordan Street and Botany Road should have been further expanded as major arterials to preserve residential areas. It was also suggested that the location of the tunnel and interchange be relocated to avoid demolition of houses.

Response

Chapter 4 of the EIS outlines the way in which alternative operational scenarios were developed and assessed for the project. At all stages from identifying the initial project options to selecting the preferred project, property acquisition was a relevant factor under consideration. As outlined in Section 4.1.1 of the EIS, the need for property acquisitions was also a relevant consideration during the tender evaluation process, whereby three tender designs were evaluated for their performance, including environmental and social performance.

Feasible alternative options for the project design (refer Section 4.3.1 of the EIS) included the central alignment option and the northern alignment option. These options may have reduced the need to acquire land by respectively:

- Reducing the need for land acquisitions around Marsh Street and the Kogarah Golf Course
- Reducing the need for land acquisitions at some locations by constructing an interchange on vacant land at St Peters which could be separated out from live traffic.

However these alternatives would have required large numbers of other property acquisitions, and also contained design and performance constraints (refer Section 4.3.1 of the EIS).

Furthermore, the preferred tunnel length of the project (longer tunnel length or shorter tunnel length) was selected due to various performance criteria, as well as the fact that it would require fewer property acquisitions (refer Section 4.3.3 of the EIS).Six locations were also considered for the St Peters interchange, where property acquisitions was also a relevant selection factor (refer Figure 4-4 of the EIS). The preferred location of the St Peters interchange at the current site of the Alexandria Landfill was chosen due to a range of criteria, including the fact that it would minimise residential property acquisitions (refer Section 4.2.2 of the EIS). The preferred motorway alignment which was selected for the project includes a tunnel alignment further south than those considered in the early strategic design options, and is therefore considered to have less impact on areas of environmental performance, as well as taking advantage of more suitable geological conditions. With a longer tunnel alignment and interchange location at the Alexandria Landfill site, it also reduces some of the need to acquire properties (refer Section 4.5 of the EIS). It also provides improved opportunities for future transport connections.

While efforts have been made to reduce the need for property acquisitions where reasonable and feasible, altering the project footprint to increase property acquisitions around Bourke Street, O'Riordan Street and Botany Road is not be considered as a reasonable and feasible alternative design in terms of the performance criteria that the project is required to meet, as outlined in Chapter 4 of the EIS.

5.4.18 St Peters interchange

Three submitters raised issues regarding the St Peters interchange

Issue description – alternatives to St Peters interchange

Submissions relating to St Peters interchange question why the flyover cannot be replaced with a simple intersection (e.g. with traffic lights).

Response

The St Peters interchange was designed to provide an integrated connection to the local road network and direct connections between:

- The New M5 and the future Sydney Gateway
- The future M4–M5 Link and the future Sydney Gateway
- The local road network and the future M4–M5 Link
- The local road network and the future Sydney Gateway.

These connections to the local road network were identified as preferred as they provide connections to key upgraded local roads including Euston Road and Campbell Road / Campbell Street for vehicles using the New M5 and the wider WestConnex program of works, as well as with the areas of predicted future population growth in inner south-west Sydney.

Due to the number and complexity of the required connections, the provision of a signalised intersection would not be sufficient to provide the required connections whilst maintaining the desired network performance.

The reference design was modified by the preferred tenderer during the tender selection process to comprise a four-level interchange. The modified layout of the interchange was preferred over the reference design as it:

- Achieves all of the traffic movements required by the mandatory functional requirements and reference design
- Simplifies ramp movements with larger ramp radii, which also provides for safer movements for heavy vehicles
- Is less expensive to construct when compared to the reference design.

The multi-level design of the St Peters interchange would provide grade-separated connectivity and efficient connection between roads. It would also remove any direct interfacing of traffic traveling in opposing directions and would allow posted speed limits to be maintained, providing safe and efficient connections between roads.

5.4.19 Kingsgrove and Bexley surface works

No issues raised in community submissions were categorised under 'Kingsgrove and Bexley surface works'.

5.4.20 Arncliffe surface works

No issues raised in community submissions were categorised under 'Arncliffe surface works'.

5.5 Project operation

5.5.1 General project design

412 submitters raised issues regarding project design.

Issue description – slip lanes

Submissions raised concern over the use of slip lanes at intersections in St Peters due to the capacity for them to create delays and access issues for pedestrians.

Response

The project has been designed to ensure pedestrian safety, manage potential delays which would impede pedestrian connectivity and deliver the necessary road infrastructure to safely and efficiently manage the forecast traffic volumes.

It is acknowledged that the upgrades to local roads around the St Peters interchange would result in an increase in the total number of trafficable lanes to be traversed by pedestrians at some intersections. This would include slip lanes in some instances, which are required to maintain an acceptable level of road network performance.

The addition of slip lanes and the concurrent increase in total trafficable width which would need to be crossed by pedestrians at some intersections may result in a minor addition to the total crossing time. However, this potential increase would be balanced in relation to pedestrian light phasing which would be further developed in detailed design. Through prioritisation of pedestrian crossing phasing it would be possible for pedestrians to cross local streets in one movement, despite the addition of slip lanes.

Throughout the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. Although slip lanes exist on some local roads, the additional distance of roadway for pedestrians to cross would be ameliorated through the provision of dedicated signalised or zebra pedestrian crossings. Many of these crossings do not currently exist (e.g. Euston Road / Campbell Road and Euston Road / Sydney Park Road), thus the overall connectivity benefits for pedestrians would be improved by the project.

Pedestrian and cyclist safety would be further assured by providing paths separated from traffic around St Peters including:

- A separated pedestrian and cyclist path as part of the new Campbell Road pedestrian and cycle bridge, extending east / west and linking the existing Bourke Street cycle path with Sydney Park. The separated pedestrian and cycle path over the canal would be a dedicated cycle and pedestrian bridge that is physically separated from the road bridge
- A new bridge to allow pedestrians and cyclists to travel across Campbell Road uninhibited by road traffic and provide additional connection into Sydney Park from Campbell Road. This bridge would also provide an active transport link from Sydney Park to the network of paths and public open spaces within the St Peters interchange.

In response to issues raised in submissions, a change has been made around the Sydney Park Road / Huntley Street / Euston Road intersection (detailed in **Section 7.2** of this report).

The design, as proposed in the EIS, included a high angle left turn lane ('slip lane') with a pedestrian island for eastbound traffic travelling on Sydney Park Road and wishing to travel northbound on Euston Road. In response to feedback, the pedestrian island has been removed. Further, the left turn turning lane for southbound traffic on Euston Road on approach to the Sydney Park Road / Huntley Street / Euston Road intersection has been shortened to rationalise road space at this location and respond to concerns regarding distances of pedestrian crossings.

Issue description – impacts to Harber Street

Submissions expressed concern that the project would restrict access to Harber Street (and consequently the Sydney Park car park) and would result in impacts to Harber Street residents and users of Sydney Park. Submissions stated that access would be time-consuming and have the potential to isolate users (i.e. residents along Campbell Road).

Response

The project would result in the permanent closure of Harber Street to the south of Campbell Road, including:

- Harber Street between Holland Street and Campbell Road
- Campbell Lane between Albert Street and Harber Street
- Holland Street between Woodley Street and Harber Street

Figure 5-33 of the EIS shows the configuration of the project around the Campbell Road / Euston Road intersection, including Harber Street.

The permanent closure of these roads and intersections would be required in order to facilitate:

- The St Peters interchange site (details are provided in Section 5.6 of the EIS), which would connect the New M5, the future M4–M5 Link and the future Sydney Gateway with:
  - Euston Road at the intersection of Campbell Road
  - Gardeners Road at the intersection with Kent Road via a new bridge over the Alexandra Canal
  - Sydney Airport and Port Botany via the future Sydney Gateway.
- Upgrades to Campbell Road in order to safely and efficiently accommodate the expected traffic volumes (details are provided in Section 5.7.2 of the EIS).

The upgrades to local roads around the St Peters interchange, which includes road widening works along Campbell Road, would result in an increase in the total number of trafficable lanes to be traversed by pedestrians and vehicles.

The project would result in left-in, left-out turning provisions only for eastbound traffic for Harber Street. However, time-associated impacts for vehicles accessing Harber Street are not anticipated to be significant and are considered reasonable to efficiently manage the efficient functioning of the St Peters interchange.

The project would also provide a broader series of works to improve pedestrian and cyclist accessibility around Sydney Park. The proposed local road upgrades include a new road bridge over the Alexandra canal connecting with Mascot and improved turning provisions with the upgrade to the Princess Hwy - Campbell Street intersection.

Issue description – advertising within WestConnex lease

A submitter recommended that advertising should not be permitted within the WestConnex lease area both during construction and operation.

Response

Any advertising, other than signage required for the construction and operation of the New M5, would be carried out in accordance with *State Environmental Planning Policy No 64 – Advertising and Signage*.

5.5.2 Active transport

14 submitters raised issues regarding active transport.

Issue description – Pedestrian and cyclist connectivity

Submissions requested that substantial active transport options should be included in the project, in particular pedestrian and cycle friendly options to be provided as an alternative to car use.

Submissions also expressed concern that the project would not improve or would worsen pedestrian and cyclist connectivity and restrict active transport opportunities in the future.

Response

The project would deliver around 14 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.

Throughout the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. Following exhibition of the EIS and in response to submissions, additional work has been undertaken to build on the work completed to date, and to ensure pedestrian and cyclist facilities are consistent with existing State and local government policies and strategies.

New active transport infrastructure in the St Peters, Mascot and Alexandria precincts would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure.

Campbell Street

Campbell Street contains footpaths immediately adjacent to the northern and southern sides of the road, which are of varying quality. At present the width of these paths varies with some sections as little as 1.2 metres wide. There are no street trees or dedicated cycling facilities.

As part of the project, pedestrian footpaths would feature on both sides of the street, with consistent width and paving materials. A dedicated cycleway would be constructed on the northern side of the road and street trees would line the both sides of the street. At Simpson Park the street tree canopy would be selectively planted to ensure the existing figs within the park are featured. Both the pedestrian footpaths and cycleway would be separated from the road via a combination of street trees and landscape verges.

Euston Road

At present the pavement on the western side of Euston Road is fairly regular, however its width does not adequately accommodate a shared pedestrian and cycle zone. Street tree plantings on the western side are generally consistent and feature a mature canopy. The path on the eastern side of Euston Road is irregular in width and quality.

Project works along Euston Road would create a dedicated shared path on the western side of adequate width to accommodate both pedestrian and cycle movements. The shared path would be separated from the roadway through a landscaped verge. Through further investigation of lane widths, Roads and Maritime would determine whether elements of the existing street trees on the western side can be retained. The eastern side would include street tree plantings where possible, with the remainder of the street retaining the existing trees.

Pedestrian connectivity would be enhanced through the installation of dedicated crossings at signalised intersections, none of which exist at present.

Sydney Park Road

There is currently a pedestrian footpath on the southern side of Sydney Park Road that is of good quality. Semi mature trees currently line the street.

The project would continue the shared path of Euston Road on the southern side of Sydney Park Road up to the extent of local road upgrade works. This would complement the existing cycle route in this location and also better accommodate both pedestrian and cycle movements through increased path width. A crossing at the intersection of Sydney Park Road and Euston Road would provide a new connection for pedestrians and cyclists in this location.

Gardeners Road

The western extent of Gardeners Road currently contains footpaths of varying quality and width. Street trees line the majority of the street, however the species are varying.

Project works along Gardeners Road would upgrade the pedestrian footpaths with regular width and materials, improving the amenity and safety for pedestrians. Street trees would be included where possible, given building setback would become closer to the roadway.

Bourke Road

The section of Bourke Road between Gardeners Road and the project extension of Campbell Street features pedestrian paths of varying quality and width. The Bourke Street cycleway begins in this location, just north of the existing Thrifty car rental premises. Streets trees on the eastern side are mature, but irregular in pattern.

The most significant addition as a result of the project would be a connection between the northern and southern extents of the Bourke Street cycleway with a dedicated crossing over Gardeners Road. This would ensure that cyclists do not have to dismount and cross Gardeners Road. Pedestrian footpaths would be improved in terms of both quality and regular width, both north and south of Gardeners Road. Street tree planting would be included on both sides of the street and be regular in pattern and species selection.

New active transport infrastructure in the St Peters, Mascot and Alexandria precincts would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure. The active transport elements being provided as part of the project would also support and enable future pedestrian and cyclist connectivity opportunities. These would include:

- Providing opportunities for connection to a possible future extension of the Alexandria Canal cycleway by City of Sydney
- Design of the Alexandra Canal bridge such that it would not preclude a future connection to a path on the western side of the Alexandria Canal
- Design to allow for future connection to active transport infrastructure associated with WestConnex Stage 3 (M4–M5 Link)
- Allowing for potential future connection to the Princes Highway from Canal Road or into bike friendly roads in lanes running parallel with Princes Highway
- Allowing for a future gateway and connector to Alexandria Canal cycleway near Tempe Reserve and further west to Cooks River cycleway (the project is a component of the overall strategic link between the inner west and the Botany Precinct)
- Offering active transport opportunities to future residential developments in the area through Euston Road improvements and improvements around Barwon Park Road
- Enabling future improvements in the Marrickville area to further integrate the network
- Enabling possible future improvement to Barwon Park Road (by reducing road use to one lane and reducing traffic volume).

Issue description – management of increased foot / bike traffic

Submissions queried how the increased pedestrian and cyclist traffic and subsequent garbage and waste on the street front and the over bridge from Campbell Road to Sydney Park would be managed.

Response

The management of garbage and litter along or adjacent to the operational project alignment is beyond the scope of the EIS and would be a function of the relevant local council. Garbage and litter collection would continue as normal, as managed by the local council. It is acknowledged that the project may result in some garbage collection disruption during construction.

5.5.3 Tunnels

No issues raised in community submissions were categorised under 'tunnels'.

5.5.4 Operational facilities

No issues raised in community submissions were categorised under 'operational facilities'.

5.5.5 Ventilation facilities

Nine submitters raised issues regarding ventilation facilities.

Issue description – location of ventilation outlets

Submissions stated that the location of the ventilation outlets was unclear in the EIS and requested confirmation of their location. A submission also sought confirmation as to whether a ventilation outlet would be located in Camdenville Park at St Peters.

Response

The project would include three ventilation outlets, at the:

- Kingsgrove motorway operations complex (MOC1) - refer to Figure 5-38 of the EIS
- Arncliffe motorway operations complex (MOC3) - refer to Figure 5-40 of the EIS
- St Peters motorway operations complex (MOC4) - refer to Figure 5-41 of the EIS.

The locations and heights of the New M5 (and future M4–M5 Link) ventilation outlets are provided in Table 10-23 of the EIS. The exact location of ventilation outlets within the ventilation facility would be confirmed during detailed design.

No tunnel ventilation facilities (including ventilation outlets) would be located in Camdenville Park at St Peters. The nearest ventilation facility would be at the St Peters motorway operation complex (MOC 4), which would be located near the western corner of the St Peters interchange, adjacent to the Princes Highway / Canal Road intersection, on land previously occupied by the Canal Road construction compound (C8).

The tunnel ventilation systems and facilities are discussed in Section 5.8.2 of the EIS.

Issue description – ventilation outlets should be filtered

Submissions requested the installation of filters into the ventilation outlets.

Response

Assessment of the need for and benefits of end-of-pipe pollution abatement equipment (such as filtration technology) is in the Technical working paper: Air quality (Volume 2B Appendix H, Section 11.2.2). This shows that there was no beneficial impact on air quality by implementing tunnel air filtration and the consequences for human health were not further assessed.

Analysis of the ventilation outlet contribution (unfiltered) to the total concentrations of air pollutants has shown that this component of the total is extremely small as shown in Figures 9-34 and 9-54 of Appendix H of the EIS. Removing this component would result in no material change in air quality in the surrounding community. Any predicted changes in the concentration of pollutants would be driven by changes in the surface road traffic.

Only a small proportion of road tunnels around the world are equipped with air treatment systems. 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 TP08, 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.

Issue description – ventilation facilities should be solar powered

A submission requested that the ventilation facilities be solar powered.

Response

The project has been designed to minimise energy consumption and maximise efficiency, in accordance with the WestConnex Sustainability Strategy Framework objectives and targets (refer to Table 28-3 of the EIS). For example, at least six per cent of construction energy required for the project would be sourced from renewable energy generated onsite and / or an accredited GreenPower energy supplier.

Specific to the ventilation facilities, the project has been optimised to:

- Reduce power consumption through the design of the ventilation system, which incorporate low pressure fans that consume around 50 per cent less energy compared with a high pressure fan solution. These low pressure fans are oriented vertically which also reduces the total ventilation structural footprint by 20 to 30 per cent, reducing the amount of embodied energy.
- Reduce power consumption associated with tunnel ventilation by locating the ventilation facilities close to the main alignment tunnel portals thereby optimising the piston effect generated by vehicles moving through the main alignment tunnels.

Notwithstanding these design measures, the power requirements of the project's ventilation facilities would remain at a level where fully solar powering the facilities would not be feasible and reasonable. However, additional low carbon energy generation options would be investigated as part of the design process in order to reduce the demand on mains electricity where feasible. Details regarding energy efficiency are provided in Chapter 22 of the EIS.

5.5.6 Connectivity

No issues raised in community submissions were categorised under 'connectivity'.

5.5.7 Surface infrastructure at Kingsgrove

One submitter raised issues regarding surface infrastructure at Kingsgrove

Issue description – request for playground at Glamis Street at Kingsgrove

Submission requested that a children's playground be provided in the proposed parkland at Glamis Street at Kingsgrove.

Response

The Kingsgrove North construction compound (C1) would be partly located within the existing M5 East Motorway corridor, and partly on land currently zoned and used for public recreation and light industrial development. The use of Beverly Grove Park North would be temporarily restricted during construction and would be rehabilitated and returned for public recreation at the end of construction.

Provision and maintenance of a playground or other recreational facilities at Beverly Grove Park North at the completion of the project would ultimately be the responsibility of Canterbury City Council.

Landscaping plans for the area to be rehabilitated and returned for public recreation would be developed during detailed design in order to minimise visual impacts and improve the amenity of the future open space area. These plans would be developed in consultation with Canterbury City Council to ensure they integrate appropriately with the design of Council's open space area. Subject to Council's agreement these plans could include the provision of playground equipment or similar enhancements.

5.5.8 Surface infrastructure at Bexley

No issues raised in community submissions were categorised under 'surface infrastructure at Bexley'

5.5.9 Surface infrastructure at Arncliffe

No issues raised in community submissions were categorised under 'surface infrastructure at Arncliffe'

5.5.10 Surface infrastructure at the St Peters interchange

One submitter raised issues regarding surface infrastructure at the St Peters interchange.

Issue description – Campbell Road pedestrian and cycle bridge

Submission expressed concern over the need to raise the Campbell Road pedestrian and cycle bridge at St Peters as there is an existing footpath below.

Response

The Campbell Road pedestrian and cycle bridge as described in Section 5.7.6 of the EIS is part of a broader series of works to improve pedestrian and cyclist connectivity around Sydney Park. The raised bridge would ensure a safe cyclist and pedestrian environment by minimising the interface between cyclists, pedestrians and vehicular traffic.

Importantly, raising the bridge above the road network and adjoining existing footpath means that users are able to move along the bridge without having to wait at intersections and / or pedestrian crossings, including:

- Campbell Road / Burrows Road
- Euston Road / Campbell Road / New M5 on and off ramps
- Crossing Campbell Road into and out of Sydney Park.

This would also benefit road users as it allows for traffic to move more freely through these intersections and along Campbell Road.

5.5.11 Local road upgrades

1,028 submitters raised issues regarding the local road upgrades.

Issue description – Euston Road widening

Submissions expressed concern with the proposed widening of Euston Road including:

- The distance between the proposed widened Euston Road and adjacent buildings, including residential buildings north of the intersection with Sydney Park Road
- Concerns that residential buildings along Euston Road were not constructed having regard to the revised distance between the road and the building
- Queries regarding the legality of locating the widened Euston Road in the proposed proximity to existing buildings
- Concerns around the potential safety risks to residents along Euston Road when Euston Road widening is completed

- General concerns about loss of amenity due to the revised proximity of Euston Road to residential buildings along Euston Road north of the intersection with Sydney Park Road on the western side of Euston Road

Response

As described in Section 5.7.1 of the EIS, widening of Euston Road between the upgraded intersection of Campbell Road and Euston Road and the intersection of Euston Road and Maddox Street would be undertaken as part of the project to ensure safe and efficient connections to the New M5 and to cater for future local population and traffic growth.

Chapter 13 of the EIS details land use zonings and development patterns in and around the New M5 project footprint. Most of the land adjacent to Euston Road upgrade works is zoned for and currently occupied by industrial and public open space developments. A short section of land, on the western side of Euston Road between Sydney Park Road and Maddox Street, is occupied by medium density residential development. This residential development is separated from the existing carriageway of Euston Road by land reserved for acquisition under the *Sydney Local Environmental Plan 2012.* The reserved land has been historically protected in anticipation of the need to widen this part of Euston Road.

Widening of Euston Road south of the intersection with Sydney Park Road is not anticipated to result in amenity impacts on adjacent receivers as buildings along this section are comprised primarily of commercial and industrial uses.

The section of Euston Road between Sydney Park Road and Maddox Street includes two multi-unit residential buildings on the western side of the road. The upgraded kerb and footpath would separate the road from apartment buildings. Landscaping at the north end of Euston Road around this section would also be provided as part of the project. This is shown on **Figure 7-4** of this report.

As stated in Section 5.7.7 of the EIS, new works would be designed generally in accordance with relevant Australian Standards, Austroads Design Standards, Guides and Codes, and the Roads and Maritime supplements to these documents. This would ensure that works are designed in a safe and operable manner.

To ensure safety, a road safety audit would be undertaken by a qualified auditor(s) as part of the detailed design and again immediately prior to project opening, to examine the design from a road safety perspective and identify potential safety issues. This process would be undertaken in accordance with the Roads and Maritime Accident Reduction Guide Part 2: Road Safety Audits (RTA, 2005a).

Lane widths on Euston Road would be reviewed during detailed design to reduce road space and optimise verge space. Additionally the high angle left turn lane from Sydney Park Road to Euston Road has been removed in response to feedback and would improve pedestrian safety, amenity and increase verge space (as clarified in **Section 7.2** of this report).

Potential impacts for receivers adjacent to the modification works proposed along this section of Euston Road have been assessed in the relevant sections of the EIS, including Chapter 9 (Traffic and transport), Chapter 10 (Air quality), Chapter 12 (Noise and vibration) and Chapter 14 (Visual impacts and urban design).

Management and mitigation measures are summarised in the relevant chapters of the EIS and in **Chapter 8** (Revised environmental management measures) of this report and include consideration of these receivers' eligibility for at-property acoustic treatment to manage operational noise impacts as a result of the project.

Issue description – Campbell Road Widening

Submissions raised concerns regarding the proposed widening of Campbell Road, including:

- A lack of clarity regarding the specific nature of works associated with the widening of Campbell Road, particularly with regard to impacts to property (acquisition, noise, access, location of ventilation portals)
- The distance between the proposed widened Campbell Road and adjacent buildings.

Response

The upgrade and widening of Campbell Road is discussed in Section 5.7.2 and shown in Figure 5-32 to Figure 5-34 of the EIS. Campbell Street / Campbell Road is currently one traffic lane in each direction with the kerbside providing parking along Campbell Road.

To provide efficient connections to the New M5 as well as facilitating motorist access to areas of urban and residential development around St Peters and surrounds, Campbell Street / Campbell Road would be widened in three sections:

- Between Unwins Bridge Road and the Princes Highway to provide two traffic lanes in each direction, separated by line marking or a median in some places, some sections would also have on-street parking provisions
- Between the Princes Highway and Euston Road to provide three traffic lanes in each direction. Eastbound and westbound traffic lanes would be separated by a median, which would be provided at variable widths to accommodate turning lanes at intersections
- Between Euston Road and Burrows Road to provide two lanes in each direction, separated by a median.

The majority of works required to widen Campbell Road would be conducted in the existing road reserve along the southern side of Campbell Road (westbound carriageway). The kerbside lanes on Campbell Road have been designed such that they could be converted to bus lanes if and when required in the medium to long term.

Details of land acquisition along Campbell Street and Campbell Road are provided in Figures D-9 to D-11 and Figure D-14 in Appendix D of the EIS. Additional details of the area to be acquired are provided in Table D1 of Appendix D of the EIS.

Setback distances between road infrastructure and adjacent buildings would be determined during detailed design and generally in accordance with relevant Australian Standards, Austroads Design Standards, Guides and Codes, and the Roads and Maritime supplements to these documents. This would ensure that works are designed in a safe and operable manner.

Issue description – road widening along outlet from the St Peters interchange

Submissions requested additional detail regarding the connections between the St Peters interchange and local roads, including:

- Widening of Euston Road
- Clarification around potential Sydney Gateway alignment including on and off ramps at the St Peters interchange.

Response

Details of Euston Road upgrades are provided in Section 5.7.1 of the EIS. Further information regarding these works is provided in **Section 5.5.11** of this report.

Figure 5-25 of the EIS shows the operational layout of the St Peters interchange. The interchange would ultimately provide connection to the future Sydney Gateway which would extend south of Canal Road. To facilitate this potential future connection, the section of the future Sydney Gateway shown in Figure 5-25 of the EIS, including on and off ramps, would be constructed as part of the project.

The St Peters interchange would connect the additional future stages of work as shown in Figure 5-26 of the EIS. These stages would be subject to future environmental assessment and approval.

Issue description – changes to existing access lanes

Submissions note that residents and buses currently safely access property and bus stops respectively along Gardeners Road, via a lane (in front of 635 Gardeners Road) that would no longer be available following construction of the project. Concern was raised regarding the loss of this lane and it was requested that it be preserved for use.

Response

Gardeners Road would be widened in the vicinity of the upgraded Bourke Road / Bourke Street / Gardeners Road intersection and would consist of:

- An additional through lane for westbound traffic
- A new concrete median between the eastbound and westbound carriageways
- Two right-turn lanes for westbound traffic to turn into Bourke Road.

The widening works would generally be undertaken on the northern side of Gardeners Road. Further details are provided in Section 5.7.4 of the EIS.

Figure 9-22 of the EIS shows the bus stops requiring closure or relocation (temporary or permanent) as a result of the project. The existing bus stop outside of the apartments at 635 Gardeners Road at Mascot would not be impacted.

A footpath would be available to pedestrians, facilitating safe access to the bus stop and nearby properties on Gardeners Road (travelling west). Motorists accessing property would still be able to do so via left hand turns (travelling west) into apartment car park areas.

Issue description – location of bus stops, lanes and routes

Submissions raised issues and questions regarding the removal or repositioning of bus stops, bus lanes and bus routes, including bus stop locations between Bourke Street and O'Riordan St.

Response

Changes to bus infrastructure during operation of the project would not impact bus stop locations along Gardeners Road between Bourke Street and O'Riordan St. The locations of bus stops that would be either temporarily or permanently impacted are described in Section 9.3.2 and shown on Figure 9-22 of the EIS.

To accommodate construction of the project, some bus stops would be removed and / or relocated as part of the local road upgrades at St Peters and Mascot, including:

- The existing bus stop on Euston Road northbound, south of the intersection with Maddox Street, would be temporarily relocated during the local road upgrades. The bus stop would be reinstated at the completion of construction
- The bus stop on the southbound side of Canal Road along route 418 (Burwood to Bondi Junction) near the intersection of the Princes Highway would be permanently relocated further south along Canal Road to accommodate construction vehicles accessing the Canal Road construction compound (C8) (refer to **Section 6.9** for additional detail). The final location of this bus stop would be determined during detailed design and in consultation with Transport for NSW (TfNSW) and Sydney Buses.

Due to their location, the following bus stops would be temporarily removed at the start of construction and reinstated in a similar location at the earliest possible time during or following construction:

- Princes Highway (southbound) outside 136 Princes Highway, St Peters
- Bourke Road (northbound) outside 81A to 83 Bourke Road, Mascot
- Bourke Road (northbound) outside 520-530 Gardeners Road, Mascot
- Gardeners Road (eastbound) outside 538 to 540 Gardeners Road, Mascot.

Bus customers would be informed of the changes through a Transport for NSW-approved program of communication.

The project offers a flexible design which does not preclude bus priority measures being included in the future. Roads and Maritime and Transport for NSW would continue to work together to deliver Sydney's Bus Future, which may be extended to this area in due course, at which point the surface road network can be adapted to include measures identified at a future date.

Any changes to traffic arrangements would be subject to separate future assessment and approvals.

Issue description – speed limits

Submissions queried speed limits on local roads, specifically regarding:

- Changes to sign posted speed limits on local roads
- Residents' safety along local roads
- Gardeners Road at Mascot
- Campbell Road at St Peters.

Response

The project has been designed generally in accordance with Australian Standards, the Austroads Guides, as well as Roads and Maritime design guides and supplements.

Table 5-7 of the EIS (Section 5.7.7) lists the project posted speed limits and the design speeds that have been applied to each component of the project.

The proposed posted speed limit along Gardeners Road at Mascot and Campbell Road (between Barwon Park Road and Bourke Road) is 60 kilometres per hour for vehicles traveling in both directions (i.e. no change is speed limits).

To ensure safety, a road safety audit would be undertaken by a qualified auditor(s) as part of the detailed design and again immediately prior to project opening, to examine the design from a road safety perspective and identify potential safety issues. This process would be undertaken in accordance with the Roads and Maritime Accident Reduction Guide Part 2: Road Safety Audits (RTA, 2005).

Safety for residents is anticipated to be improved through the overall improvements to the pedestrian and cycle network in the area. Through provision of dedicated footpaths, shared paths and cycleways and the separation of these movements from traffic, accessibility and safety for pedestrian and cyclists in and around St Peters interchange would be improved over the current situation.

Traffic safety submission queries are further discussed in **Section 5.8.12** of this report.

Issue description – Euston Road and McEvoy pedestrian crossing

Submissions queried the measures being put in place to allow for safe and convenient pedestrian crossing of Euston Road and McEvoy Street following the road widening.

Response

The project does not include works on McEvoy Street.

The proposed works would include a number of signalised pedestrian crossings along Euston Road (refer to Table 5-4 of the EIS), including:

- Euston Road / Sydney Park Road / Huntley Street intersection
- Campbell Road / Euston Road intersection
- Two sets of signalised pedestrian crossings along Euston Road between the abovementioned intersections, as shown in Figure 5-29 of the EIS.

The addition of these crossing points creates an improvement in pedestrian accessibility and safety as these crossings do not currently exist. At present there is are no dedicated pedestrian crossings in the above mentioned intersections.

Additionally the high angle left turn lane from Sydney Park Road to Euston Road has been removed in response to feedback and would improve pedestrian safety, amenity and increase verge space (as clarified in **Section 7.2** of this report).

Issue description – Coulson Street

Submissions expressed concern with the proposed removal of the right turn from Mitchell Road into Coulson Street, as it would force residents onto King Street.

Response

The project would not involve works on Coulson Street from Mitchell Road. The extent of the project footprint around St Peters is identified on Figure 5-8 of the EIS.

Issue description – access impacts to May Street from Princes Highway

Submissions expressed concern that right-turn access from the Princes Highway into May Street would be removed in the future. Subsequently this would severely limit car access to Hutchinson Street and Lackey Street.

Response

The local road upgrades included as part of the project are detailed in Section 5.7 and shown on Figures 5-29 to 5-36 of the EIS. The project does not include works at the intersection of May Street and the Princes Highway.

However, as part of its ongoing responsibilities to manage the performance of the road network, Roads and Maritime is separately considering upgrades at some locations near the New M5 local road upgrade works (outside this project). Two locations in particular are under consideration:

- The intersection of Sydney Park Road and Mitchell Road - prohibition of right-hand turn movements from Mitchell Road into Sydney Park Road. The local road upgrades included in the New M5 project would result in the prohibition of right-hand turn movements from Sydney Park Road southbound onto Euston Road (excluding buses). As a result, some additional through traffic could travel through the area to the west of Euston Road. By restricting the right-hand turn at the intersection of Mitchell Road and Sydney Park Road, this movement would be prohibited for general traffic and would limit these additional movements through the area. Alternatives to prohibition of right-hand turn movements from Mitchell Road into Sydney Park Road may be possible, and Roads and Maritime would continue to monitor the situation after opening the New M5 to determine whether any of these works are required
- The intersection of May Street and the Princes Highway - alterations to the layout of the Princes Highway / May Street intersection to only allow left-in and left-out turning movements at May Street to prevent traffic travelling southbound to turn right onto May Street from the Princes Highway. The New M5 provides an alternative route to provide access to May Street, involving a right turn at the Princes Highway / Campbell Street intersection, which is currently prohibited. Further alternatives may be possible, and Roads and Maritime would continue to monitor the situation after opening the New M5 to determine whether any of these works are required.

These two separate future projects have been included in the traffic forecasts used to inform the preparation of the EIS for the New M5 project.

Issue description – access to and from Brown Street and Florence Street

Submissions raised concern that access to and from Brown Street and Florence Street onto Campbell Street would be restricted.

Response

Section 5.7.2 of the EIS outlines intersection modifications around Campbell Street that would be carried out as part of the project. The alterations to Campbell Street from Brown Street and Florence Street would occur to ensure traffic safety and optimal network performance.

It is acknowledged that access to and from both Brown Street and Florence Street onto Campbell Street would result in left-in, left-out (westbound) turning provisions only. However additional access for:

- Brown Street would be available via Conway Place and Unwins Bridge Road
- Florence Street would be available via Silver Street and Unwins Bridge Road.

Issue description – local road upgrade footprint

Submissions requested clarification regarding the works near the St Peters interchange, stating that the works would only be within the footprint of the construction area.

Response

The construction footprint around the St Peters interchange and local road upgrades is identified in Figure 6-4 of the EIS. Construction works would be contained within the construction footprint. Further refinements to minimise land acquisition would be considered during detailed design.

Issue description – clarification of Euston Road / Sydney Park Road / Huntley Street intersection

Submissions sought clarification regarding the impact that the project would have on the Sydney Park Road / Euston Road intersection. Submissions further expressed concern that right-turn access from Sydney Park Road / Mitchell Road intersection would be removed in the future.

Response

As part of the project, the Euston Road / Sydney Park Road / Huntley Street intersection would be upgraded from a roundabout arrangement to a signalised intersection. The design, as proposed in the EIS, included a high angle left turn lane with a pedestrian island for eastbound traffic travelling on Sydney Park Road and wishing to travel northbound on Euston Road.

In response to submissions concerning pedestrian amenity and safety, the pedestrian island has been removed. Further, the left turn turning lane for southbound traffic on Euston Road on approach to the Sydney Park Road / Huntley Street / Euston Road intersection has been shortened as this was not required for intersection performance and rationalises road space at this location.

The right turn southbound lane from Euston Road onto Sydney Park Road at this intersection would be for buses only. This restriction has been placed on the intersection to maintain an acceptable level of road network performance. An alternative route, along Maddox Street and Mitchell Road, would remain available for those motorists wishing to access Sydney Park Road from Euston Road. Roads and Maritime would monitor the performance of this intersection and the restriction on right hand movements during operation of the project, to ensure that acceptable traffic flow and network performance outcomes are being achieved.

The amended intersection layout is discussed in the Preferred Infrastructure Report and shown in **Figure 7-4** of this report.

Issue description – Maddox Street

Submissions sought clarification regarding the Maddox Street intersection.

Response

The project does not include physical changes to the Maddox Street / Euston Road intersection, although local road upgrades would affect Euston Road immediately south of this intersection.

In response to issues raised in submissions, changes have been made to the local upgrade works along Euston Road, and at the intersection of Euston Road and Sydney Park Road. These changes are detailed in the Preferred Infrastructure Report (**Chapter 7** of this report) and shown in **Figure 7-4** of this report.

Although there would be no physical changes to the Maddox Street / Euston Road intersection, changes to the Euston Road / Sydney Park Road intersection to only allow a right hand turn from Euston Road southbound into Sydney Park Road would mean that motorists wanting to access Sydney Park Road from Euston Road would need to take the alternative Maddox Street / Mitchell Road route. Roads and Maritime would monitor the performance of Euston Road / Sydney Park Road and the restriction on right hand movements during operation of the project, to ensure that acceptable traffic flow and network performance outcomes are being achieved.

5.5.12 Wayfinding

No issues raised in community submissions were categorised under 'wayfinding'.

5.5.13 Landfill

No issues raised in community submissions were categorised under 'landfill'.

5.6 Construction work

5.6.1 Construction program and staging

Two submitters have raised issues regarding the construction program.

Issue description – construction impacts

Submissions have raised general concerns regarding the impact that construction work could have on:

- Local communities
- Residents along the route.

Response

The construction methodology and program for the project balances the need for construction to occur in a safe and efficient manner while managing constructability constraints and minimising impacts on local communities, the environment, users of the M5 East Motorway and the surrounding road network. This has required a balance between the speed of construction activities and the ability to reasonably and feasibly mitigate impacts within acceptable limits.

The potential impacts on local communities and examples of how this was considered can be seen in each of the Chapters in the EIS. A range of measures were also proposed in Chapter 30 (Summary of environmental management measures) of the EIS (as revised in Chapter 8 (Revised environmental management measures) of this report) to mitigate the potential impacts of the project, including measures relating to construction and the construction and operation of ancillary facilities.

Opportunities to further reduce construction timeframes while protecting local amenity would be considered during the detailed design process. In addition, consultation with property owners likely to be impacted by construction activities would be undertaken as necessary prior to and during construction.

A complaints handling process would be established prior to the commencement of construction activities and would be available to the local community and residents to raise concerns with regard to construction-related issues.

Issue description – access from Brown Street onto Campbell Street during construction

Submissions request that continuous access from Brown Street onto Campbell Street be provided through temporary traffic lights or traffic controllers.

Response

During construction, Brown Street would be subject to temporary partial and full road closures, and diversions to facilitate construction (as detailed in Table 6-22 of the EIS). The staging of any closure or modifications would include:

- Access to Brown Street from Campbell Street would be partially closed
- Brown Street would require full closure for short periods of time
- Kerb side parking would be removed within the construction footprint.

These temporary closure and modifications to Brown Street would ensure the functionality of surrounding roads is maintained, as well as the safety of members of the public, motorists and construction personnel. Alternative access during times of impact to Brown Street would be available via the Princes Highway and / or Unwins Bridge Road.

A Construction Traffic Management and Safety Plan would be completed prior to the commencement of construction in consultation with the relevant road authority, local councils and other stakeholders where relevant and would be informed by the outcomes of the traffic and transport assessment presented in Chapter 9 and Appendix G (Technical working paper: Traffic and transport) of the EIS. The plan would include measures to control access from Brown Street onto Campbell during construction works, which may involve traffic controllers, temporary traffic signals or other appropriate management measure.

5.6.2 Construction methods

764 submitters have raised issues regarding the construction methods.

Issue description – vibration from tunnelling impacts

Submissions objected to the selection of tunnelling methods due to potential damage to buildings at the surface. Submissions have also raised concerns that:

- The project had prioritised the construction timeline over the risk of vibration damage to residents' property
- The consideration blasting scope and methodology, and impacts to communities along the tunnel alignment during excavation have been left to the post-approval stage.

Response

The construction methodology for tunnelling was selected to achieve the shortest potential exposure to vibration for residents and businesses above the tunnels.

As part of the development of tunnel options during the tender selection process tunnelling excavation and construction methods were evaluated. Four tunnelling excavation and construction methodologies were considered for the project:

- Excavation using tunnel boring machines (TBMs)
- Excavation using road headers in combination with drill and blast
- Excavation using drill and blast
- Excavation using a combination of road header and TBMs.

The evaluation concluded that excavation using road headers in combination with drill and blast techniques would be advantageous for the following reasons:

- Provides a cost effective construction method
- Provides a more certain delivery program
- Produces about 20 per cent less spoil across the length of the main alignment tunnels compared to using TBMs
- More flexibility in tunnel construction compared to using TBMs
- Less area required for tunnel support compounds throughout construction compared to using TBMs.

Use of a road header alone would have disadvantages relating to tunnelling speed and maintenance. The use of drill and blast in tandem with the road header would offset these disadvantages.

The potential vibration impacts of tunnel excavation with regard to building damage were assessed in Section 12.4.1 of the EIS (Noise and vibration). As with ground-borne noise, receivers would experience elevated vibration levels only while tunnel construction activities are conducted beneath or close to residential properties.

Tunnelling would typically progress at an average of around seven metres per day. It is likely that vibration would be discernible for around five days at each affected receiver with potential exceedances of the criteria set for human comfort occurring for around two days.

Tunnelling advance rates would reduce to around two to five metres per day around the portals, which may increase the duration of exposure for receivers in these areas. As tunnelling moves toward and away from each receiver, the vibration experienced would be lower.

As discussed in Section 6.5.4 of the EIS, the bench (lower section) in the mainline tunnels would be excavated using drill and blast techniques. The drill and blast excavation method involves a sequence of the drilling of holes, charging the holes with explosive, blasting, mucking out and installing the roof and wall ground support.

Blast patterns would be designed and sequenced to minimise impacts of vibration on residents and businesses above the tunnels. Blasting would only be undertaken underground and only in locations where the geology is suitable for safe and effective use. Blasts would be limited to one single detonation in any one day per receiver group, unless otherwise agreed by the NSW EPA through consultation on the Construction Noise and Vibration Management Plan.

As stated in section 6.7.2 of the EIS, blasting would only be undertaken during the following hours:

- 9.00 am to 5.00 pm Monday to Friday inclusive
- 9.00 am to 1.00 pm Saturday
- At no time on a Sunday or on a public holiday.

Further detailed assessment and the blast trial process would be described in the Blast Management Strategy, prepared during the detailed design.

Building condition surveys would be undertaken on properties and structures located:

- Within the project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels)
- Where the potential for exceedances of the blasting criteria is identified.

Building condition surveys of potentially affected structures would be completed both before the start of tunnelling or other vibration intensive works and after completion of works, to identify existing damage and any damage resulting from the works.

Residents would be able to contact the project hotline if they have concerns about tunnelling activities.

Vibration management measures, including consultation with affected receivers, are identified in Section 12.5 of the EIS and would be further detailed in the construction noise and vibration management plan(s) for the project.

Detailed information regarding the tunnelling method for the project is provided in Section 6.5.4 of the EIS. A number of submissions relating to tunnelling impacts have also been responded to in this report. Queries regarding:

- General property damage have been addressed in **Section 5.12** of this report
- The tunnelling vibration impact assessment has been addressed in **Section 5.10** of this report
- The settlement impact assessment has been addressed in **Section 5.18** of this report.

5.6.3 Location and layout of ancillary facilities

12 submitters have raised issues regarding the location and layout of construction ancillary facilities.

Issue description – Sydney Park construction compound (C14)

Submissions objected to the use of Sydney Park for a construction compound and were concerned that the compound is larger than required. Submissions also recommended that the construction compound at Sydney Park be relocated to make use of adjacent industrial land.

Response

The Sydney Park construction compound (C14) would be used to service the construction of pedestrian and cycling facilities associated with the local road upgrades, including the Campbell Road pedestrian and cycle bridge over Campbell Road.

The Sydney Park construction compound (C14) would be located on the northern side of Campbell Road in Sydney Park at St Peters on an area of open space used for public recreation.

The location of the construction compounds, including the Sydney Park (C14) compound, was determined following an assessment against the following criteria:

- Be positioned more than 50 metres from a waterway
- Be located within or adjacent to land which would form part of the operational project footprint
- Have ready access to the road network
- Minimise the need for heavy vehicles to travel through residential areas
- Be located on relatively level land
- Be separated from residential dwellings by more than 200 metres, or 300 metres for temporary concrete batching plants
- Be situated in an area of low ecological significance and not require additional vegetation clearance (above that required for the operational footprint of the project)
- Not impact on Aboriginal or non-Aboriginal heritage items
- Not affect land use of adjacent properties
- Have no / minimal impact on flood storage and does not obstruct floodplain or culverts
- Be positioned outside of the 20 year ARI flood level
- Have sufficient area for the storage of raw materials to minimise the requirement for out-of-hours deliveries.

The potential location of the Sydney Park construction compound (C14) on adjacent industrial land would have met less of the above criteria when compared to the selected location. It would have also likely required additional property acquisition.

The total area of Sydney Park that would be leased from the City of Sydney for the Sydney Park construction compound (C14) would be around 0.55 hectares. The area of Sydney Park that would be occupied by the construction compound would be re-instated and returned for public recreation at the end of construction, with the exception of the areas of land required permanently for the footprint of the pedestrian and cycle bridge and paths.

Key construction activities to be undertaken at the Sydney Park construction compound (C14) include:

- Site establishment activities
- Construction activities associated with the pedestrian and cycle bridge over Campbell Road
- Construction of the bridge over Campbell Road
- Construction of a shared pedestrian and cycle path in Sydney Park
- Plant and equipment laydown and storage area
- Demobilisation.

Demobilisation and rehabilitation activities are planned to be completed by the second quarter of 2019.

Amenity impacts on Sydney Park from the use of a section of the park for a construction compound were identified and assessed within the relevant sections of the EIS including Air quality (Chapter 11), Noise and vibration (Chapter 12), Traffic (Chapter 9), Land use and property (Chapter 13), Visual impact and urban design (Chapter 14) and Social and economic (Chapter 15).

With the implementation of environmental management measures (as revised in Chapter 8 (Revised environmental management measures) of this report), construction of the project is not anticipated to have a significant or lasting impact on the area of open space at Sydney Park to be used temporarily for the construction compound. Furthermore with improved connectivity for pedestrians and cyclists with access to new open space around the St Peters interchange, the use of Sydney Park for construction staging is expected to result in an overall improvement to recreational amenity.

Issue description – Kingsgrove North construction compound (C1)

Submissions requested that the proposed location of the Kingsgrove North construction compound (C1) within an area of remnant vegetation should be reconsidered and an alternative location found. Further submissions objected to the carpark within the compound and requested the use of an existing carpark located on Garema Circuit as an alternative due to concerns regarding noise and visual impacts to residents, and the area of park required for parking.

Response

The Kingsgrove North construction compound (C1) would be located on the northern side of the existing M5 East Motorway between Canterbury Golf Course and Garema Circuit, Kingsgrove.

The location of the construction compounds, including the Kingsgrove North (C1) compound, was determined following an assessment against the following criteria:

- Be positioned more than 50 metres from a waterway
- Be located within or adjacent to land which would form part of the operational project footprint
- Have ready access to the road network
- Minimise the need for heavy vehicles to travel through residential areas
- Be located on relatively level land
- Be separated from residential dwellings by more than 200 metres, or 300 metres for temporary concrete batching plants
- Be situated in an area of low ecological significance and not require additional vegetation clearance (above that required for the operational footprint of the project)
- Not impact on Aboriginal or non-Aboriginal heritage items
- Not affect land use of adjacent properties
- Have no / minimal impact on flood storage and does not obstruct floodplain or culverts
- Be positioned outside of the 20 year average recurrence interval (ARI) flood level
- Have sufficient area for the storage of raw materials to minimise the requirement for out-of-hours deliveries.

The potential location of the Kingsgrove North construction compound (C1) on nearby alternative sites would have met less of the above criteria when compared to the selected location. It would have also likely required additional property acquisition.

The location of the car park and site office associated with the Kingsgrove North construction compound (C1) as shown on Figure 6-6 of the EIS would be further refined with alternatives considered during detailed design, including the opportunity for the use of the existing Garema Circuit carpark.

The implementation of a left in and right out arrangement for heavy vehicles at the Garema Circuit access point to the Kingsgrove North construction compound (C1) would be considered during construction planning to potentially restrict heavy vehicles to using only the eastern side of Garema Circuit.

Impacts from the Kingsgrove North construction compound (C1) were identified and assessed within the relevant sections of the EIS including Biodiversity (Chapter 21), Air quality (Chapter 11), Noise and vibration (Chapter 12), Traffic (Chapter 9), Land use and property (Chapter 13), Visual impacts and urban design (Chapter 14) and Social and economic impacts (Chapter 15).

Appropriate biodiversity offsets for the project in relation to Cooks River Castlereagh Ironbark Forest were identified according to the requirements of the *NSW Biodiversity Offsets Policy for Major Projects* (the biodiversity offsets policy) (OEH, 2014c) and the *Framework for Biodiversity Assessment* (FBA) (OEH, 2014b). Further details are provided in Section 21.4.1 of the EIS.

Issue description – Campbell Road construction compound (C9)

Submissions requested that the proposed location of the Campbell Road construction compound (C9) be reconsidered and moved 50 metres away from the current Campbell Road alignment, suggesting that this would reduce the visual impact, noise impact and light impact of this construction zone.

Response

The Campbell Road construction compound (C9) would be located on the southern side of Campbell Road between Woodley Street and Harber Street at St Peters. The compound would be mainly used to support construction of the St Peters interchange and local road upgrades.

The location of the Campbell Road construction compound (C9) was determined following an assessment against the following criteria:

- Be positioned more than 50 metres from a waterway
- Be located within or adjacent to land which would form part of the operational project footprint
- Have ready access to the road network
- Minimise the need for heavy vehicles to travel through residential areas
- Be located on relatively level land
- Be separated from residential dwellings by more than 200 metres, or 300 metres for temporary concrete batching plants
- Be situated in an area of low ecological significance and not require additional vegetation clearance (above that required for the operational footprint of the project)
- Not impact on Aboriginal or non-Aboriginal heritage items
- Not affect land use of adjacent properties
- Have no / minimal impact on flood storage and does not obstruct floodplain or culverts
- Be positioned outside of the 20 year ARI flood level
- Have sufficient area for the storage of raw materials to minimise the requirement for out-of-hours deliveries.

The potential location of the Campbell Road construction compound (C9) on adjacent land would have met less of the above criteria when compared to the selected location. The location of the compound is around 50 metres from the current Campbell Road alignment for about half of the compound length and around 30 metres from the current Campbell Road alignment for the other half.

Visual impact, noise impact and light impacts from the Campbell Road construction compound (C9) were identified and assessed within the relevant sections of the EIS including Noise and vibration (Chapter 12) and Visual impacts and urban design (Chapter 14).

With the implementation of environmental management measures as revised in **Chapter 8** of this report, Campbell Road construction compound (C9) impacts are not anticipated to be substantial.

Issue description – surface works construction

Submissions have raised concern about lack of detailed information on the location of surface works.

Response

The location of surface works during construction is provided in Chapter 6 of the EIS. Figure 6-1 to Figure 6-4 of the EIS outlines the surface construction footprint. Details of temporary construction compounds are provided in Section 6.5.3 of the EIS.

Local road upgrades are detailed in Section 5.7 of the EIS.

Issue description – construction compound for Camdenville Park

Submissions were concerned a construction compound has not been provided for the local road upgrades and drainage works at Camdenville Park.

Response

Some minor construction facilities would be provided at Camdenville Park to support the Camdenville Park upgrades and nearby local road works.

The majority of construction of the local road upgrades would be supported by the following compounds:

- Campbell Road construction compound (C9)
- Burrows Road construction compound (C11)
- Campbell Road bridge construction compound (C12)
- Gardeners Road bridge construction compound (C13)
- Sydney Park construction compound (C14).

Section 6.5.3 of the EIS outlines compound locations, purposes, activities and indicative programs.

5.6.4 Hours of work

984 submitters have raised issues regarding hours of work.

Issue description – 24 hour construction activities

Submissions have raised concerns that residents near to the project would be subjected to construction works 24 hours a day, seven days a week (including heavy vehicle movements). Specific concerns related to traffic, air quality impacts and noise.

Response

The majority of surface construction would be undertaken during standard working hours. Some construction activities would need to be undertaken outside standard construction hours (i.e. night) for reasons including:

- Public and construction worker safety
- Design and quality considerations
- To minimise the length of construction and the duration of any associated amenity impacts on the local community
- To avoid significant traffic interruptions along the M5 East Motorway and the surrounding arterial and local road network.

To minimise the overall length of construction and the duration of amenity impacts on the local community, tunnelling works are proposed to be carried out 24 hours a day, seven days a week. As the Canal Road (C8) construction compound supports the tunnelling works, it would operate continuously, the associated tunnel support activities (including spoil haulage) would also be undertaken up to 24 hours a day, seven days a week.

Spoil haulage outside of standard construction hours would be from:

- Kingsgrove North (C1) construction compound
- Commercial Road (C3) construction compound
- Bexley Road North (C4) construction compound
- Bexley Road South (C5) construction compound
- Arncliffe (C7) construction compound
- Canal Road (C8) construction compound.

Construction works would only be conducted outside of standard construction hours where the works are required for tunnel excavation and supporting activities at Canal Road (C8) and at other locations where it would not generate a significant noise impact, or where required for safety or road network operational reasons. To carry out these activities during standard construction hours would either not be feasible from a road safety or traffic management perspective, or would not be unreasonable as only minor noise impacts are anticipated.

The following sections provide additional detail regarding the types of feasible and reasonable noise management measures which would be considered to manage and mitigate potential noise impacts.

Construction site noise

To mitigate and manage construction site noise, the following approach would be employed:

- A review of the predicted construction noise impacts, including any refinements to the assessment presented in this EIS as a result of detailed design
- Identification of receiver specific management measures depending on the level of predicted construction noise impact relative to rating background levels (RBLs).

Potential management measures would include:

- Letterbox drop – notification of construction activities as part of periodic community updates distributed across areas surrounding construction activities
- Noise verification – receiver or catchment specific noise verification used to confirm the construction noise performance of the project and to proactively inform, where relevant, review and update noise management measures, and site construction practices
- Individual briefing – offers of individual briefings about relevant construction activities and potential impacts with potentially affected receivers
- Receiver specific notifications – individual correspondence to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Receiver specific contact – individual phone calls, emails, or visits to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Respite periods – programming of feasible and reasonable respite periods for potentially affected receivers
- Alternative accommodation – offers of reasonable alternative accommodation for receivers potentially affected by construction activities conducted at night (from 10 pm to 7 am). Alternative accommodation would be subject to consultation with the affected receiver and would take into account the duration and intensity of the potential impact.

Noise from construction compounds

To manage and mitigate noise associated with the operation of compound sites, sheds would be erected at the construction compounds that are proposed to support 24 hour tunnelling activities. Acoustic sheds would be utilised at Kingsgrove North (C1), Bexley Road North (C4) and Bexley Road South (C5) construction compounds. Non-acoustic sheds would be erected at Commercial Road (C3), Arncliffe (C7) and Canal Road (C8) construction compounds. During night time tunnelling activities, all works would be located within the sheds and doors would be kept closed.

Excavated spoil from tunnelling would be stockpiled within sheds at these tunnelling support construction compounds.

Spoil haulage from these tunnel support construction compounds would be limited to the regional and State road network. Where practicable, spoil haulage would be moved during the day and outside of peak periods. Feasible and reasonable management strategies would be investigated to minimise the volume of heavy vehicle movements at night. Any spoil removal outside standard construction hours would meet the relevant noise criteria.

Plant and equipment selection and location

The selection of plant and equipment can have a significant impact on construction noise levels. Appropriate plant would be selected for each task to minimise the noise contributions. Alternative works methods such as use of hydraulic or electric-controlled units in place of diesel units would be considered and implemented where feasible and reasonable. The use of alternative machines that perform the same function (such as rubber wheeler plant) would be considered in place of steel tracked plant. Equipment would be regularly inspected and maintained to ensure it is in good working order.

Plant would be located onsite with as much distance as possible between the plant and noise sensitive receivers. Noisy equipment would be orientated away from residential receivers where feasible and reasonable.

Noise barriers

Where practicable, permanent noise barriers would be scheduled for completion as early as possible so they can assist in mitigating construction noise. However, in a number of areas, the existing noise walls or parts of the existing noise walls would have to be demolished before the new wall can be constructed due to accessibility and safety. In these circumstances, an assessment of feasible and reasonable noise management measures would be undertaken.

Where reasonable and feasible, the use of temporary noise walls or hoarding would be investigated where works or compounds are in proximity to residential receivers. The proposed noise barrier locations can be found in Technical working paper: Noise and vibration (Appendix J of the EIS).

Noise monitoring

A noise monitoring program would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress.

The construction noise and vibration management plan(s) (CNVMPs) to be prepared for the project would include additional detail regarding the management measures. These would be implemented to avoid, minimise and / or manage impacts. The CNVMPs would be prepared and implemented consistent with the requirements of the *Interim Construction Noise Guideline* (DECC, 2009), including:

- Identification of nearby residences and other sensitive land uses
- Description of approved hours of work
- Description and identification of construction activities, including work areas, equipment and duration
- Description of what work practices (generic and specific) would be applied to minimise noise and vibration
- A complaints handling process
- Noise and vibration monitoring procedures
- Overview of community consultation required for identified high impact works.

Noise management measures would be further refined during the construction planning phase of the project in consultation with the NSW Environment Protection Authority. Further, the environment protection licence for the project would provide for appropriate management of construction noise impacts.

5.6.5 Landfill closure during construction

No issues raised in community submissions were categorised under 'landfill closure during construction'.

5.6.6 Utilities

No issues raised in community submissions were categorised under 'utilties'.

5.6.7 Safety

Three submitters have raised issues regarding safety management during construction.

Issue description – temporary diversion of shared path during construction

Submissions requested the temporary diversion of the shared path at Beverly Grove Park North to be located a significant distance from residential fence lines adjoining the Kingsgrove North construction compound. This would provide for an open corridor between the temporary noise barrier and residential fence lines, enhancing safety for adjoining residents and path users.

Response

Section 6.5.3 and Figure 6-6 of the EIS show that the realigned Beverly Grove Park shared path would generally follow the temporary noise barrier along the northern boundary of the Kingsgrove North construction compound (C1), before re-joining the existing shared path. The distance between adjoining residential fence lines and the noise barrier would allow no room to move the shared path away from the residential fences.

Lighting would be provided along this section of the temporarily diverted shared path.

5.7 Consultation

5.7.1 Level and quality of consultation

4,514 submitters have raised issues regarding the level and quality of community consultation undertaken.

Issue description – level and quality of consultation

Submissions have raised concerns about the level and quality of consultation including:

- There was a lack of consultation effort
- The quality and comprehensiveness of communication materials was lacking
- Insufficient regard was given to particular sectors of the community, including local residents and businesses
- The engagement was not genuine
- The proponent was not responsive to queries and issues raised through consultation
- There was a lack of transparency surrounding the project and design decisions.

Response

Consultation effort

The community and stakeholder consultation effort for the project has included activities before and during the display of the EIS using a variety of communication and engagement methods. These included a website, a centralised WestConnex information telephone line, a project email and postal address, an online 'Have your say' form, community updates, newspaper advertisements, community information sessions, fact sheets, face to face meetings and briefings. Communications materials included information on available translation services.

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) and the Secretary's Environmental Assessment Requirements (SEARs). Consultation activities targeted affected communities, including local residents and businesses, and were planned and advertised well in advance.

The consultation effort began in mid-2012, as part of early consultation on the WestConnex program of works during the development of the *WestConnex Strategic Environmental Review* (Sydney Motorways Project Office, 2013) and the *WestConnex Business Case* (Sydney Motorways Project Office 2013) which were published in September 2013. Feedback received during this period informed the project development, the environmental assessment activities and ongoing communications.

More detailed, community and stakeholder consultation commenced following the State significant infrastructure application in November 2014. This included project specific information including preliminary details of the proposed tunnel route, indicative western portal locations and the St Peters interchange. Consultation activities included:

- A community update delivered to 8700 properties in St Peters, Tempe, Alexandria, Sydenham, Botany and Mascot
- Project fact sheets distributed to commercial and industrial properties along Canal Road, the Princes Highway, Campbell Street, Campbell Road, Euston Road and Burrows Road
- Updates to the WestConnex website
- An email to 3300 registered stakeholders
- Advertisements in five local newspapers
- Four community information sessions at St Peters, Enmore and Newtown
- Door knocking of properties with land zoned as road reserve
- Individual face to face meetings with residential, industrial and commercial property owners and business operators to discuss property impacts including property acquisition.

In June 2015, consultation activities were undertaken to provide the community and stakeholders with information about the location of the western portals and associated permanent operational facilities (including the Kingsgrove ventilation facility) within the M5 East Motorway corridor at Kingsgrove. These activities included:

- A community update delivered to more than 27,000 residences and businesses around Kingsgrove, Beverly Hills and Bexley North
- Individual face to face meetings with residential, industrial and commercial property owners and business operators to discuss property impacts including property acquisition
- Doorknocking of about 200 residences closest to the temporary construction compound sites and permanent facilities at Kingsgrove and Beverly Hills
- Six advertisements in three local newspapers providing information about the western portals at Kingsgrove and the community drop in session
- Two community information drop in sessions at Kingsgrove RSL.

During July and August 2015 consultation for the midway tunnelling point at Arncliffe included:

- Meetings and briefings with representatives from the Kogarah Golf Club Board and management, and with John Boyd Properties
- A community update delivered to about 14,000 residences and businesses around Arncliffe and Wolli Creek
- Distribution of a project fact sheet to members of Kogarah Golf Club
- A fact sheet, titled 'Protecting our community and environment' placed on the WestConnex website

- An email to 3500 registered stakeholders
- Updates to the WestConnex website
- Doorknocking of about 150 residences closest to the midway tunnelling point
- Two community information drop in sessions at Kogarah Golf Club.

Consultation efforts for the selection of the preferred design and contractor in September 2015 included:

- A community update delivered to about 60,000 residents and businesses along the project corridor between Beverly Hills and St Peters
- A community update delivered to about 30,000 residents and businesses between Arncliffe and St Peters
- A community update delivered to about 30,000 residences and businesses along the project corridor near Bexley and Bexley North
- An email to about 3500 registered stakeholders
- Doorknocking of about 70 residences around Bexley Road
- Doorknocking of about 40 apartment residences at the corner of Euston Road and Sydney Park Road in Alexandria
- Advertisements in six local newspapers inviting community members to drop-in information sessions
- Three community drop in sessions at Wolli Creek, St Peters and Kingsgrove.

The EIS was placed on public display for a period of 64 days, which is longer than the minimum statutory exhibition period. As described in **Chapter 2** of this report, consultation activities continued during the public exhibition period. This included:

- Static display of the EIS at 21 locations spread across and around the project corridor
- Preparation of a project overview document that summarised the project, provided details of how to view the full EIS and encouraged readers to make a submission
- Preparation and distribution of project fact sheets and brochures
- Community updates
- WestConnex website updates
- Meetings with property owners
- Meetings and briefings with stakeholders
- Seven community drop-in sessions to provide opportunities for the community and stakeholders to discuss the EIS with technical specialists and members of the New M5 project team
- A 1300 number and project email
- WestConnex information kiosks in key shopping precincts.

Quality and comprehensiveness of communication materials

Community and stakeholder consultation was undertaken by qualified community consultation personnel, who were supported by technical specialists involved in preparing the EIS for the project. This meant that communication materials included comprehensive technical information about the project, were written in plain English, and included maps and diagrams where needed.

The needs of key stakeholder and community audiences have been carefully considered in the development of all New M5 public communication materials.

In general, the public communication materials included:

- Information about the key impacts and benefits associated with the New M5, written in plain-English
- Clearly labelled maps, photographs and artists' impressions
- Information about how to contact the New M5 team to find out more information
- Information on how to access translating and interpreting services.

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 along the project corridor
- Utilities and service providers – including water, gas, electricity and telecommunications
- The broader community – including potential future users of the project.

If the project is approved, future consultation would be undertaken with regard to construction activities and the management of impacts.

Genuine engagement

Roads and Maritime, via Sydney Motorway Corporation (SMC), has sought to provide genuine engagement during preparation of the project design and EIS. This has involved using a range of methods including community information sessions, meetings, briefings, door-knocks, letter box drops and emails.

Responsiveness to queries and issues

In the period between the lodgement of the State significant infrastructure application for the project in November 2014 and the announcement of the preferred design and construct tenderer in September 2015, SMC sought feedback from community and stakeholders on key features of the New M5 design including:

- The indicative design of the St Peters interchange and associated local road upgrades
- The western entry and exit to the New M5 tunnels in Kingsgrove
- The mid tunnel construction site at Kogarah Golf Course, Arncliffe.

SMC engaged extensively with stakeholders and community during this period using a range of methods including community information sessions, meetings, briefings, door-knocks, letter box drops and emails. Further information about these activities is detailed in Chapter 7 of the EIS.

The issues, concerns and suggestions provided by the community and stakeholders during this period were recorded and provided to the three shortlisted consortia selected to tender for the design and construction of the project. This feedback was considered by the tendering consortia and used to inform the development of their respective tender designs.

Transparency of project and design decisions

Roads and Maritime, via SMC, has sought to provide transparency around project design and development. This has involved using a range of methods including community information sessions, meetings, briefings, door-knocks, letter box drops and emails.

5.7.2 Consultation during exhibition

No issues raised in community submissions were categorised under 'consultation during the exhibition'.

5.7.3 Future consultation

11 submitters have raised issues regarding future consultation.

Issue description – future community consultation

Submissions requested continued and future consultation and transparent provision of information to local councils, groups and residents. Further consultation was also requested on particular topics including noise and dust issues during construction.

Response

As outlined in **Section 2.3** of this report, SMC, on behalf of Roads and Maritime, would continue to provide consultation opportunities for 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.

During construction, SMC would continue to work with communities, local councils and other stakeholders to ensure they remain informed about the project and have opportunities to provide feedback to the project team. Key involvement activities and tools would include, but are not limited to:

- Development and implementation of a detailed construction communications plan
- Notification of works (including targeted letterbox drops)
- 24-hour project information phone line
- Use of Transport Management Centre (TMC) communication channels
- Variable Message Signs (VMS) throughout the metropolitan road network
- Live Traffic and Transport NSW Info websites and TMC 24-hour Traffic Information Line (132 701)
- A complaints management process
- Regular updates to the WestConnex website
- Newsletters, information brochures and fact sheets
- Clear signage at construction sites
- Media releases and project advertisements in local and metropolitan papers
- Construction updates (including for local councils, emergency services and bus operators).

A more detailed description of the consultation activities and other consultation processes (including complaints management) that would be undertaken during construction can be found in the Draft Community Consultation Framework in Appendix E of the EIS.

In addition, a number of the management measures identified in the EIS would require further consultation with project stakeholders, including:

- Preparation and implementation of community consultation protocols for sensitive receivers likely to be impacted by as blasting, vibration and noise during construction
- Ongoing consultation with the NSW Environment Protection Authority regarding appropriate air quality criteria and preparation of an Air Quality Management Plan
- Consultation with relevant road authorities, local councils, emergency services, schools and road user groups regarding the preparation of a Construction Traffic Management and Safety Plan (CTMSP)
- Consultation with relevant road authorities regarding road network upgrades or closures
- Preparation of a final Urban Design and Landscape Plan in consultation with the New M5 Urban Design Review Panel, local councils within the project corridor and the local community
- Consultation with relevant State authorities regarding preparation of other environmental management plans, including a Soil and Water Quality Management Plan and a Groundwater Monitoring Plan

- Consultation with property owners likely to be affected by construction activities, to address matters such as alternative property access arrangements
- Consultation with property owners regarding acquisition in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*
- Consultation with local communities potentially affected by the impacts of multiple projects, including other components of WestConnex
- Consultation with non-English speaking residents and stakeholders including provision of access to a translation and interpreting service and a commitment to promoting this service on communication material.

Issue description – future consultation regarding parking for construction workers

Submissions requested specific consultation with local councils to monitor and control parking of employees and contractors along residential streets during the construction period.

Response

As described in Section 6.6.1 of the EIS, parking provisions for light vehicles within the project construction compounds would be provided. Parking restrictions for construction workers would be considered where feasible and reasonable and would be reinforced through project inductions and toolbox talks. Construction personnel would be encouraged to use public transport where possible and to consider other modes of transport such as carpooling.

A Construction Traffic Management and Safety Plan would be prepared as part of the Construction Environmental Management Plan for the project and would reflect the relevant conditions of approval. A car parking strategy for all construction sites would be developed as part of the Construction Traffic Management and Safety Plan to limit impacts on surrounding communities. The plan would be developed in consultation with relevant councils, emergency services, road user groups and pedestrian and cyclist user groups.

Consultation between the project team and key stakeholders including local councils, residents and business operators would continue during the construction phase. A more detailed description of the consultation activities and other consultation processes (including complaints management) that would be undertaken during construction can be found in the Draft Community Consultation Framework in Appendix E of the EIS.

Issue description – future consultation with Arncliffe Public School

One submission requested ongoing consultation with a representative of Arncliffe Public School regarding potential impacts on the school resulting from the project, including a specific request for representation at any community consultative committee that would be established as part of this project.

Response

At this stage, there is no proposal to establish a community consultative committee for the project.

As outlined in **Section 2.3** of this report, SMC, on behalf of Roads and Maritime, would continue to provide opportunities for the community and other key stakeholders to participate during the ongoing refinement of the design with a view to further minimising project impacts.

A more detailed description of the consultation activities and other consultation processes (such as complaints management) that would be undertaken during construction can be found in the Draft Community Consultation Framework in Appendix E of the EIS.

5.7.4 Endorsement of other submissions

Seven submitters expressed their endorsement of other submissions.

5.7.5 Access to documents

17 submitters have raised issues regarding access to documents relating to the project.

Issue description – access to EIS documents during exhibition

Submissions raised concerns regarding ease of accessing EIS documentation during the exhibition period. Submissions raised the following issues:

- Specific locations did not have an EIS on display
- Not all sections of the EIS were made available
- The Christmas period impacted access to documentation and created delays for members of the community in providing a submission
- The involvement of Sydney Motorway Corporation obscured a process which should be openly available to the public.

Response

Chapter 2 of this report provides details of community and stakeholder involvement, and identifies the locations where the EIS was exhibited. Electronic copies of the EIS were also available online for viewing on the DP&E and WestConnex websites during the exhibition period (and contiunue to be available online). All sections of the EIS were made publicly available.

It is acknowledged that the EIS was placed on exhibition over the Christmas period. Due to the timing of exhibition, an extended exhibition period was adopted (64 days) to allow sufficient time for the community to provide a submission. As a consequence, the public exhibition period for the New M5 EIS was more than double the statutory minimum.

Concerns regarding the involvement of Sydney Motorway Corporation have been responded to in **Section 5.2.1** of this report.

5.8 Traffic

5.8.1 Level and quality of traffic assessment for the construction period

105 submitters have raised issues regarding the level and quality of traffic assessment undertaken for the construction period.

Issue description – construction traffic modelling scope

Submissions have raised concerns that the scope of the construction traffic modelling was not wide enough to identify the system-wide impact of construction traffic.

Response

A worst case construction traffic generation scenario was assumed during the spoil removal associated with tunnel construction around the end of 2016. The current road network with no new road network augmentation projects or upgrades was assumed. In addition, it was assumed that 100 per cent of construction workers would drive a private vehicle to site, although this is unlikely to be the case in practice.

The scope of the assessment included all of the construction works within the construction footprint. The indicative construction footprint is shown in Figure 29 to Figure 32 in the Technical working paper: Traffic and transport (Appendix G of the EIS). A detailed description of the construction works is provided in Chapter 6 of the EIS.

The scope of the assessment included impacts from the construction program described in Section 6.2 of the EIS. It took into account the anticipated construction workforce and the construction work hours for the project, including works outside of standard construction hours (refer to Section 6.7 of the EIS). The scope also included construction waste management, including spoil haulage (refer to Section 6.10 of the EIS).

An integrated traffic modelling and forecasting approach was used for the traffic assessment. The modelling assessed the combined road network impacts of all construction compounds operating concurrently. The results of this modelling showed that construction of the project would result in changes and disruptions to the existing road and transport network, resulting from:

- Movement of construction vehicles
- Surface works requiring temporary traffic, cyclist and / or pedestrian diversions, road occupation, alterations to access, alterations to bus stops, temporary road closures and alterations to speed limits.

The assessment of construction traffic and transport impacts concluded that as the volume of traffic generated by construction would be relatively low compared to existing traffic, the effects of this short-term increase on the existing road network would not significantly impact the operability or safety of the road network around the project.

Issue description – insufficient response to construction traffic requirements

Submissions have raised concerns that the environmental management measures are insufficient in terms of scope, intent and detail. Specific environmental management measures included:

- Traffic Safety and Management Plan(s) – submissions requested that traffic safety and management plan(s) be prepared alongside the EIS to adequately assess potential impacts
- Road dilapidation reports - submissions requested that road dilapidation reports be prepared alongside the EIS to adequately assess potential impacts.

The following environmental management measures were identified as having an insufficient response outlined in the EIS:

- Construction staging and temporary works developed to minimise impact on the existing M5 East Motorway and provide safe separation between work areas and traffic lanes - Insufficient response given the modelled, forecast impacts and as most construction compounds are noted to be operational from 2016 to 2019. This is standard practice and cannot be claimed to be an environmental management measure to address 'road network performance and delays'
- Construction vehicle routes would maximise the use of arterial roads - Insufficient response given the EIS report itself notes that 'the construction compounds are surrounded with local roads, [so] use of the local roads is unavoidable to support the construction activities' (Appendix G, pages 185-186). More strategically and contextually appropriate construction compound placement could have mitigated this to an extent. Despite this 'measure', local roads remain essential to almost every heavy or light construction vehicle movement
- Over dimensioned vehicles procured through specialist haulage companies with permits from Roads and Maritime (RMS) - This is outside of the scope of the 'road network performance and delays' impact and instead are both standard practice (procurement through specialist company) and a requirement for the operation of such vehicles (permit obtained from Roads and Maritime). The effects of these vehicles on road network performance are not actually dealt with through the measures listed

Response

The assessment of traffic and transport impacts has been prepared in accordance with the Secretary's Environmental Assessment requirements (SEARs) for the project. The SEARs did not require that a Construction Traffic Management and Safety Plan be prepared in parallel to the assessment. It is common practice in NSW that such plans are prepared prior to commencement of construction, typically in response to conditions of approval.

The Construction Traffic Management and Safety Plan would be completed prior to the commencement of construction in consultation with the relevant road authority, local councils and other stakeholders where relevant and would be informed by the outcomes of the traffic and transport assessment presented in Chapter 9 and Appendix G (Technical working paper: Traffic and transport) of the EIS. This would be consistent with the timing of preparation of other construction management plans and sub-plans for the project.

Road dilapidation reports would be prepared at an agreed time prior to the commencement of construction to provide a baseline existing condition from which road dilapidation attributable to the project can be assessed. Road dilapidation reports would be prepared in consultation with the relevant road authority and local councils and would include mechanisms to repair damage caused by the project.

Construction methods and staging would be designed to minimise road closures and to ensure that disruptions to existing traffic, including traffic using the existing M5 East Motorway and the St Peters local roads, are minimised as far as feasible and reasonable.

This would include offline construction where feasible and reasonable, and where this is not possible (i.e where tie-in works are required between on-line and off-line sections of the project), construction sequencing and temporary works identified would aim to minimise user delay while providing sufficient flexibility to safely and efficiently construct the project.

The support in some submissions for these methods as standard practice is noted. Construction methods and staging would be further described in the Construction Traffic Management and Safety Plan that would be prepared as part of the Construction Environmental Management Plan for the project.

The use of local roads to access construction compounds has been minimised as far as feasible and reasonable. The construction haulage routes presented in the EIS are intended to be used for all construction traffic generated by the project and have been assessed on that basis.

However, there is potential that short term alternative routes may need to be considered on an ad-hoc basis as a result of incidents and emergency situations (including road blockages or closures outside the direct control of the project) or to accommodate restrictions associated with construction programming (for example, staging of activities in and around construction sites). There may also be opportunities for minor changes to traffic circulation patterns as a traffic and noise impact mitigation approach, to provide periods of respite to affected receivers.

Construction compound locations - as well as the routes to and from the construction compounds - were selected to facilitate access to the State road network including but not limited to the M5 East Motorway and M1 Princes Highway, where feasible and reasonable. This would allow vehicles to enter and exit construction compounds via the strategic road network and those roads designated as heavy vehicle routes, to minimise the impact on the local road network.

Construction compound locations were determined via an assessment against a broad set of criteria (refer to Section 4.6.3 of the EIS). This process allowed for a strategic assessment of construction compound locations that sought to minimise land acquisition, limit impacts on sensitive receivers and the environment, provide ready access to the road network and minimise the need for heavy vehicles to travel through residential areas.

Where the identified construction compounds could not meet specific criteria, additional specific management measures were identified to manage impacts associated with their use.

As described in Section 9.4 of the EIS (as revised in **Chapter 8** (Revised environmental management measures) of this report, a Construction Traffic Management and Safety Plan would be prepared as part of the Construction Environmental Management Plan, in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups.

The Construction Traffic Management and Safety Plan would include the guidelines, general requirements and principles of traffic management to be implemented during construction, including specific provisions to manage potential impacts of construction traffic on local roads around the construction compounds.

The Construction Traffic Management and Safety Plan 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 *AS1742.3: Manual of uniform traffic control devices – Part 3:Traffic control for works on roads*. It would seek to minimise delays and disruptions, and identify and respond to any changes in road safety as a result of construction works.

Delivery of oversize items may require intermittent use of the road network by oversize vehicles.

These movements would be conducted in accordance with Roads and Maritime requirements for oversize and / or overmass vehicles and loads. Access permits would be obtained to operate on the NSW road network and the Construction Traffic Management and Safety Plan would include details regarding vehicle type and load, route survey details, traffic management arrangements and relevant stakeholder and community consultations.

Delivery of oversize items would be undertaken outside of standard construction hours to minimise impacts on the efficiency of the road network and to limit safety impacts to the construction workforce and members of the public. Transit of over-dimensional vehicles and loads would be undertaken in accordance with the permit conditions set out by Roads and Maritime Services over-dimensional vehicle unit.

Issue description - insufficient response to construction traffic impacts to pedestrians, cyclists and public transport accessibility and operation

Submissions expressed concern regarding a lack of consideration of the extent of effects of increased construction traffic and works on pedestrian safety and accessibility, accessibility of public transport stops, local and stop amenity, safety of public transport users, and travel times, including:

- Insufficient detail given in Traffic and Transport report to identify those locations that would be affected in terms of pedestrian accessibility and amenity, particularly schools and children's pedestrian access routes. Such measures should be outlined in greater detail as part of this EIS report
- Insufficient detail given in Traffic and Transport report to identify those locations that would be affected in terms of cyclist accessibility and amenity, and no details as to the extent that such routes would cause increased on-road wait times, increased journey time and distance given closures to shoulders and detours, and reduced overall amenity of the area, as stated in the EIS. Also no detail on how cyclist safety on local streets would be maintained given heavy vehicle usage on these streets
- Insufficient consideration of the extent of effects of increased construction traffic and works on accessibility to stops, local and stop amenity, safety of public transport users and travel times
- Insufficient response to 'public transport' considering extent of effects of increased construction traffic and works on accessibility to stops, local and stop amenity, safety of public transport users, and travel times
- Insufficient response to maintaining pedestrian access at relocated bus stops. This action should ensure that pedestrian access is maintained at the same or higher level, including provision of disabled facilities at any temporary stops provided.

Response

As described in Section 6.6.2 of the EIS, a number of pedestrian and cyclist diversions would be put in place during construction to protect community safety. These would involve eliminating where possible interactions between pedestrians and heavy vehicles at site access points, and providing alternative pedestrian access around the construction ancillary facilities. These would include:

- Western surface works:
  - The existing shared path within Beverly Grove Park to the north of the M5 East Motorway would be permanently realigned so that it is to the north of the Kingsgrove North construction compound (C1)
  - The shared path within Beverly Grove Park to the south of the M5 East Motorway would be closed for the duration of construction due to space constraints. Pedestrians and cyclists would be diverted onto the northern path via Karingal Street and the Kindilan underpass. Pedestrian and cyclist access via the Kindilan underpass would generally be maintained during construction and would be physically separated from construction traffic to maintain safe access
  - The Kindilan underpass would be closed for around four weeks (subject to weather) during construction to accommodate its extension and would require additional intermittent closures. In instances where the underpass is closed, pedestrians and cyclists would be diverted to Karingal Street and Coolangatta Road for access between the southern and northern paths

  - The M5 East Motorway has been permanently closed to cyclists between Belmore Road and Bexley Road as part of the King Georges Road interchange upgrade. At the completion of construction of the New M5, cyclists would be able to cycle along the M5 South West Motorway from King Georges Road westwards. From King Georges Road eastwards, cyclists have been diverted onto the shared paths within Beverly Grove Park and / or surrounding local roads.

- Local road upgrades:
  - The Bourke Road cycleway would be temporarily diverted around the construction works due to space constraints
  - Pedestrian and shared path facilities in areas subject to local roads upgrades would be relocated or temporary access paths would be constructed to maintain access throughout construction
  - Concrete barriers would be installed to separate pedestrians, cyclists and the general public from construction activities where a haul road is in close proximity to a pedestrian access.

Pedestrian and cyclist access would be maintained where possible during construction. Where not feasible using existing access, 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 Construction Traffic Management and Safety Plan to be prepared in consultation with the relevant road authority, local councils, emergency services, road user groups, and pedestrian and bicycle groups. The Construction Traffic Management and Safety Plan would include measures to ensure pedestrian safety is maintained during construction. This would include selecting site compound entry and exit points which avoid school children pedestrian access routes.

Construction of the project would require that a number of bus stops be relocated during construction to protect community safety. The indicative locations of these are provided in Section 6.6.3 of the EIS. As the detailed project design develops, additional bus stops requiring relocation may be identified. Any bus stop relocations would be agreed with Transport for NSW and in consultation with affected bus operators.

Local residents, business owners and bus passengers would be notified of traffic management procedures and ongoing consultation would be undertaken to provide information on planned construction activities and changes to bus stops or access arrangements.

Section 9.3.1 of the EIS outlines the impacts of construction of the project on bus services. An increase in heavy vehicles on the existing road network during the construction period would likely result in increased delays at intersections along the project corridor and in surrounding areas. Buses would experience the same delays as general traffic at these intersections, as well as delays as a result of lower speed limits and / or manual traffic control. Additionally, users of bus services may experience longer travel times to and from bus stops by supplementary travel modes (e.g car passenger, walking to / from bus stop, etc.) due to an increase in traffic volumes, slower travel speeds and increased intersection delays

As described in Section 9.4 of the EIS (as revised in **Chapter 8** (Revised environmental management measures) of this report, a Construction Traffic Management and Safety Plan would be prepared as part of the Construction Environmental Management Plan in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups. The Construction Traffic Management and Safety Plan would include the guidelines, general requirements and principles of traffic management to be implemented during construction.

It 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 *AS1742.3: Manual of uniform traffic control devices – Part 3:Traffic control for works on roads*. It would seek to minimise delays and disruptions, and identify and respond to changes in road safety as a result of construction works.

As described in Section 9.3.1 of the EIS, an initial assessment has identified that a number of bus stops would be relocated during construction to protect community safety. These are detailed in Section 6.6.3 of the EIS. As the detailed project design develops, additional bus stops requiring

relocation may be identified. Any bus stop relocations would be agreed with Transport for NSW and in consultation with affected bus operators.

Local residents, business owners and bus passengers would be notified of traffic management procedures and alternative bus stop locations and access would be provided. Where feasible and reasonable, this would include provision of facilities for community members with a disability at temporary bus stops. Ongoing consultation would be undertaken to provide information on planned construction activities and changes to any bus stops or access arrangements.

Issue description – construction traffic impacts not assessed

Submissions expressed concerns that impacts on travel times, property access and parking during the construction of the project have not been adequately assessed.

Response

The assessment of construction traffic and transport impacts provided in Section 9.3.1 and Appendix G (Technical working paper: Traffic and transport) of the EIS assessed a conservative 'worst case' scenario for construction impacts on the surrounding road network, including impacts to travel times and on-street parking. The assessment has been undertaken in accordance with the SEARs for the project as well as relevant assessment guidelines and policies.

The assessment identified that there would be some delays along roads which would be used by construction traffic, however as the volume of traffic generated by construction activities would be expected to be relatively low compared to existing traffic, the effects of this short-term increase on the existing road network is not expected to significantly affect travel times in the project area.

Construction of the St Peters interchange and local road upgrades may result in increases in traffic volumes around construction compounds and along construction vehicle routes as detailed in the EIS. The increase in traffic volumes is not expected to affect access to existing properties along construction traffic routes.

Motorists entering or exiting properties from roads along construction traffic routes may experience minor delays due to the increase in traffic volumes. Some commercial and industrial properties along Euston Road, Bourke Road and Gardeners Road would require temporary modifications to driveways as part of the local road upgrades.

In the majority of instances, maintenance of property access would be provided for the duration of the construction program. In the event that this cannot be achieved, appropriate controls would be implemented. This would include provision of an alternative access in consultation with affected property owners.

Appropriate controls would be implemented to reduce and manage traffic-related impacts associated with the construction of the project including maintaining property access or providing an alternative access in consultation with property owners.

If the project is approved, the Construction Traffic Management and Safety Plan would form part of the Construction Environmental Management Plan and would be prepared in accordance with the relevant conditions of approval. The plan would be developed in consultation with relevant councils, emergency services, road user groups and pedestrian and cyclist user groups. Temporary and / or permanent traffic diversions would be developed in consultation with the relevant local council as a component of the development of the Construction Traffic Management and Safety Plan, which would be completed prior to the commencement of construction. The plan would be informed by the outcomes of the traffic and transport assessment presented in Chapter 9 and Appendix G (Technical working paper: Traffic and transport) of the EIS.

Parking provisions for light vehicles within the construction compounds have been provided. Construction personnel would be encouraged to use public transport where possible and consider other modes of transport such as carpooling.

A car parking strategy for all sites would be developed as part of the Construction Traffic Management and Safety Plan to limit impacts on the surrounding communities, in consultation with local councils and stakeholders.

Issue description – construction traffic impacts not assessed

Submissions relating to construction traffic raised issues regarding the lack of assessment of impacts from spoil transportation.

Response

The traffic and transport impact assessment provided in Section 9.3.1 and Appendix G (Technical working paper: Traffic and transport) of the EIS provides a comprehensive assessment of construction traffic focused on the impacts of spoil removal and the movements of light and heavy vehicles to and from construction compounds and other construction sites (including the local road upgrades around the St Peters interchange).

The transport of spoil along Roads and Maritime approved restricted access vehicle (RAV) and higher mass limit (HML) routes on the State and National road network has been prioritised in the selection of the locations of the six construction compounds which would provide the main tunnel support functions during construction. The assessment of construction traffic impacts has taken into account heavy vehicle movements to and from these compound sites.

Sites identified as potential spoil disposal locations that do not currently have the necessary environmental planning approval to accept the materials would be subject to separate assessment and approval in accordance with the requirements of the Environmental Planning and Assessments ACT (EP&A Act). Disposal of spoil from the project to particular locations would be undertaken in accordance with those other approvals.

5.8.2 Construction traffic numbers and routes

330 submitters have raised concerns regarding traffic numbers and routes during construction.

Issue description – Construction spoil routes

Submissions requested additional information regarding the rationale for using Garema Circuit / Wirega Avenue / Moorefields Road as the primary access point for the Kingsgrove North construction compound (C1) and suggested that heavy and light vehicles should access this compound via the M5 East Motorway exclusively.

A submission also objected to the use of Garema Circuit by heavy vehicles and recommended the use of an elevated belt conveyor system to a truck loading facility.

Response

The use of Kingsgrove Road, Moorefields Road, Wirega Avenue and Garema Circuit for construction vehicles to enter and exit the Kingsgrove North construction compound (C1) would be required.

Direct access to and from the Kingsgrove North construction compound and the M5 East Motorway would also be provided. This access would be used primarily during the periods outside of standard construction hours (i.e. during the night time) as the potential impacts on road safety and operability would decrease during the off-peak night time periods, when traffic volumes along the M5 East Motorway are less. During these periods, construction traffic would move between the M5 East Motorway and the Kingsgrove North construction compound and, as far as feasible and reasonable, would not use the Garema Circuit route.

The assessment of potential impacts on the local road network along this route concluded that as the existing traffic volumes along Moorefields Road and Kingsgrove Road are already high, the addition of the relatively minor amount of construction related traffic would not be expected to result in significant delays or congestion along these roads.

There would be some instances where construction work within the Kingsgrove North construction compound (C1) would mean that the direct access to the M5 East Motorway is blocked. During these periods 24 hour entry and exit to the Kingsgrove North construction compound would be required via the Garema Circuit route.

Impacts relating to noise from the use of the Garema Circuit route by construction vehicles were assessed in Section 12.4.1 of the EIS and feasible and reasonable noise management measures would be implemented. These are described in Section 12.5.1 of the EIS.

Potential noise impacts from construction traffic using this route on nearby sensitive receivers are addressed in **Section 5.10.6** of this report.

As the potential impacts of construction traffic along the Garema Circuit route has been assessed as being within acceptable limits with the implementation of feasible and reasonable management and management measures, no further consideration of alternative spoil management methods, including conveyance of spoil to a vehicle loading facility, has been undertaken.

Section 9.4 of the EIS (as revised in **Chapter 8** (revised environmental management measures) of this report, describes measures which have been designed to manage potential traffic and transport impacts resulting from the construction of the project. With respect to the use of the Garema Circuit route for ingress and egress to the Kingsgrove North construction compound, these would include:

- A Construction Traffic Management and Safety Plan would be prepared as part of the Construction Environmental Management Plan. The Construction Traffic Management and Safety Plan would include the guidelines, general requirements and principles of traffic management to be implemented during construction, including:
  - Signage requirements (e.g temporary speed restrictions, changes to the road environment, traffic management controls)
  - Lane possession and approval process during periods of online construction (e.g line marking and temporary barriers)
  - Traffic control devices such as traffic signals
  - A local and regional communications strategy, including methods to provide advanced notice of any major or prolonged impacts (e.g leaflets and local media), and real-time information regarding current impacts (e.g variable message signs, radio traffic news)
  - Details of both the general approach to be used for access and egress to construction compounds and the specific controls required at specific locations
  - Specific provisions required to manage potential impacts to sensitive users, such as schools, child care centres and health facilities.
- The Construction Traffic Management and Safety Plan 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 *AS1742.3: Manual of uniform traffic control devices – Part 3:Traffic control for works on roads*
- A Spoil Management Plan would be prepared with subsequent monitoring of heavy vehicle and haulage routes to ensure compliance and minimise impact on local roads off the arterial road network
- A road dilapidation report(s) would be prepared identifying existing conditions of local roads and mechanisms to repair damage to the road network caused by heavy vehicle movements associated with the project.

Issue description – construction vehicle movements along Garema Circuit

Submissions were received which requested that use of Garema Circuit by heavy vehicles coming to and from the Kingsgrove North construction compound (C1) be restricted to only the eastern side.

Response

In response to submissions and as part of ongoing design development, investigations are currently being undertaken into the feasibility of implementing a left-in and right-out for heavy vehicles moving to and from the Kingsgrove North construction compound (C1). This would result in the eastern side of Garema Circuit being utilised for heavy vehicles only which would assist in minimising potential noise impacts from construction traffic to nearby residential receivers on the western side of Garema Circuit. This would be confirmed during detailed design.

Issue description – spoil haulage routes not defined

Submissions relating to construction traffic raised the following issues:

- The volume of heavy vehicles and the impacts to the operation of the road network, including the contribution construction traffic would have on congestion and delays on the road network
- The use of trucks 24 hours per day, seven days per week during construction
- The EIS does not adequately assess the impact of heavy construction vehicle movements at night
- Trucks would idle in front of residents' houses.

Response

The New M5 project has been designed to minimise the generation of construction traffic where feasible and reasonable. This has included selecting the optimum size of vehicles to transport materials, plant and equipment, in order to minimise the total number of trips required during construction of the project.

Tunnelling works would occur 24 hours per day and seven days per week. As a result, heavy vehicle movements to remove spoil from the construction sites would also be required up to 24 hours per day and seven days per week. This is principally due to:

- There is limited space to stockpile spoil and therefore a need to regularly remove spoil from tunnel support sites. This is a consequence of minimising the total extent of land acquisition and surface disturbance required for the project
- Spreading traffic movements over a 24 hour period reduces peak impacts, with lower impacts on average for most receivers.

The EIS provides an assessment of the construction traffic impacts of the project in Section 9.3.1 and Appendix G, and an assessment of the construction noise impacts of the project in Section 12.4.1 and Appendix J. The construction traffic impact assessment focuses on vehicle movements during the peak periods, as this represents the worst case traffic impact scenario (peak background traffic with the addition of project construction vehicles).

Unnecessary use and idling of plant and truck engines would be minimised wherever possible. Haulage trucks when not used for periods of greater than 15 minutes would be switched off to minimise potential impacts to nearby sensitive receivers.

The construction traffic noise impact assessment considers several scenarios, including traffic noise during the day time and worst case night time traffic impact scenarios. During construction, the Construction Traffic Management and Safety Plan would be implemented to manage the movement of vehicles to and from the project site and to ensure that vehicle movements are conducted in a manner that minimises impacts on local amenity, traffic flows and road safety.

Issue description – construction traffic impacts on Campbell Road

A submission raised concerns about the number of construction vehicle movements on Campbell Road, travelling to and from the Campbell Road construction compound (C9). The submission raised concerns that the construction vehicle movements would impact the terraces on Campbell Road and suggested that construction vehicles only use the eastern access to the Campbell Road construction compound (C9) to avoid impacting the terraces.

Response

The assessment in Section 9.3.1 (St Peters interchange and local road upgrades) of the EIS determined that along Campbell Road, east of Princes Highway, construction traffic would have a minor temporary impact on the mid-block performance of the road network.

A daily total of 716 heavy vehicle and 1038 light vehicle two-way movements (inbound and outbound) has been modelled for the Campbell Road construction compound under the worst case construction traffic scenario. These movements would be dispersed across the two routes which would be used to access the site (refer to Figure 9-19 of the EIS).

Mid-block traffic volumes and level of service for 2016, with and without construction scenarios, are presented in Table 9-34 of the EIS. For Campbell Road, east of Princes Highway, eastbound traffic in the AM peak would experience a minor reduction in level of service (LoS) from LoS E to LoS F. The level of service E under the 'without project' scenario indicates that Campbell Road east of Princes Highway is already experiencing high levels of congestion and the relatively minor increase associated with construction traffic would have only a minor impact considering existing background traffic levels. The level of service for westbound traffic in the AM peak would be LoS A under both the 'with construction' and 'without construction' traffic scenarios.

Eastbound traffic in the PM peak would experience the same level of service under both the 'with construction' and 'without construction' traffic scenarios. Westbound traffic would experience a minor reduction in level of service from LoS C to LoS D in the PM peak.

If the project is approved, the Construction Traffic Management and Safety Plan would form part of the Construction Environmental Management Plan and would be prepared in accordance with the relevant conditions of approval. The plan would be developed in consultation with relevant councils, emergency services, road user groups and pedestrian and cyclist user groups.

Issue description – movements of construction vehicles along Bexley Road

A submission requested that the Construction Traffic Management Plan for the project require construction vehicles transporting spoil to use the kerbside lane when travelling on Bexley Road westbound between Barnsbury Grove and Shaw Street.

Response

This requirement would be considered for inclusion in the Construction Traffic Management and Safety Plan.

As described in Section 9.4 of the EIS (as revised in **Chapter 8** (Revised environmental management measures) of this report), a Construction Traffic Management and Safety Plan would be prepared as part of the Construction Environmental Management Plan for the project, in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups.

The Construction Traffic Management and Safety Plan would include the guidelines, general requirements and principles of traffic management to be implemented during construction, including specific provisions to manage potential impacts of construction traffic on local roads around the construction compounds.

The Construction Traffic Management and Safety Plan would be prepared in accordance with the Austroads *Guide to Road Design* (with appropriate Roads and Maritime supplements), *Traffic Control at Work Sites* (RTA, 2010) and *AS1742.3: Manual of uniform traffic control devices – Part 3:Traffic control for works on roads*. The plan would seek to minimise delays and disruptions, and identify and respond to any changes in road safety as a result of construction works.

Issue description – restriction of construction vehicle travel times

A submission requested that construction vehicles transporting spoil be prohibited during the morning, evening and weekend road traffic peaks.

Response

The New M5 project has been designed to minimise the generation of construction traffic where feasible and reasonable. This has included selecting the optimum size of vehicles to transport materials, plant and equipment, in order to minimise the total number of trips required during construction of the project.

Tunnelling works would occur 24 hours per day and seven days per week. As a result, heavy vehicle movements to remove spoil from the construction sites are also likely to be required up to 24 hours per day and seven days per week. This is principally due to:

- There is limited space to stockpile spoil and therefore a need to regularly remove spoil from tunnel support sites. This is a consequence of minimising the total extent of land acquisition and surface disturbance required for the project
- Spreading traffic movements over a 24 hour period reduces peak impacts, with lower impacts on average for most receivers
- Current congestion on the M5 East Motorway corridor and the broader strategic road network during and around peak hours and high traffic volumes at other times of the day, limit the ability to remove spoil for large periods during day time hours.

The Construction Traffic Management and Safety Plan would include the guidelines, general requirements and principles of traffic management to be implemented during construction, including specific provisions to manage potential impacts of construction traffic on local roads around the construction compounds. Consideration would also be given to limiting heavy vehicle construction traffic during AM and PM peak periods and during special events where feasible and reasonable.

The Construction Traffic Management and Safety Plan 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 *AS1742.3: Manual of uniform traffic control devices – Part 3:Traffic control for works on roads*. The plan would seek to minimise delays and disruptions, and identify and respond to any changes in road safety as a result of construction works.

5.8.3 Impact on network performance due to construction

857 submitters have raised concerns regarding the performance of the road network as a result of construction traffic.

Issue description – congestion during construction

Submissions have raised the following issues relating to the road network performance during construction of project:

- General concerns that road users, including local residents would be impacted by construction traffic movements, including impacts to the local road network, increasing delays, and impacts relating to noise and amenity
- Specific concerns that construction vehicles would cause traffic congestion along:
  - Moorefields Road at Kingsgrove
  - Euston Road at St Peters
- Concern that the narrowness of Moorefields Road would mean that construction vehicles would queue at the intersection of Moorefields Road and King Georges Road at Kingsgrove.

Response

The assessment of construction traffic and transport impacts in Section 9.3.1 and Appendix G (Technical working paper: Traffic and transport) of the EIS identified that some roads which would be used by construction traffic would experience minor delays. However, the volume of traffic generated by construction would be expected to be relatively low compared to background traffic flows along the routes to be used by construction vehicles and the effects of this short-term increase on the existing road network are not expected to significantly impact the operability or safety of the road network in the project area.

The construction traffic noise impact assessment considers several scenarios, including traffic noise during the day time and worst case night time and early morning traffic impact scenarios. During construction, a Construction Traffic Management and Safety Plan would be developed and implemented to manage the movement of vehicles to and from the project site and to ensure that vehicle movements are conducted in a manner that minimises impacts on local amenity, traffic flows and road safety.

The Construction Traffic Management and Safety Plan would be developed in consultation with relevant councils, emergency services, road user groups and pedestrian and cyclist user groups.

The EIS provides an assessment of the construction noise impacts of the project in Section 12.4.1 and Appendix J. Section 12.5.1 of the EIS details the management measures which would be employed during construction to manage potential noise impacts. Noise impacts during construction resulting from construction traffic are discussed further in **Section 5.10.6** of this report.

The EIS also provides an assessment of potential amenity impacts during construction in Section 15.3.1 and Appendix M. Amenity impacts arising from construction traffic are discussed in **Section 5.14.2** of this report.

Impacts from construction traffic along Moorefields Road at Kingsgrove

Moorefields Road at Kingsgrove has been assessed as being of sufficient width to accommodate construction traffic from the project.

The intersection performance results for the intersections in the vicinity of Moorefields Road are summarised in Table 9-28 of the EIS.

Compared to the 'without construction' scenario the Moorefields Road / Wirega Avenue / Chapel Street intersection would continue to operate at LoS E during construction. However, the average delay would increase by around 13 seconds in the AM peak and around six seconds in the PM peak.

Table 9-7 in Section 9.3.1 of the EIS presents the forecast mid-block performance of the road network around the western surface works, including along Moorefields Road, east of Chapel Street. Construction traffic traveling to and from the Kingsgrove North construction compound (C1) is forecast to result in the following change to traffic volumes during the AM and PM peak periods (compared to the 'without construction' scenario):

- An increase in light vehicles of around one per cent
- An increase in heavy vehicles of around 22 per cent.

Moorefields Road, east of Chapel Street, would operate at the same level of service as under the 'without construction' scenario during both the AM and PM peak, for traffic heading both eastbound and westbound. This indicates that the operation of the road network would be similar with and without construction of the project, mainly due to the small volume of total construction traffic relative to expected background traffic volumes.

Construction traffic is therefore unlikely to contribute substantially to congestion impacts along Moorefields Road (and the broader area around the western surface works) although average delays at some intersections would increase slightly during the peak periods.

Impacts from construction traffic along Euston Road at St Peters

Construction vehicles would not use Euston Road to access the construction compounds servicing the construction of the St Peters interchange and the local road upgrades. Figure 6-14 of the EIS shows the location of construction compounds to be used for the St Peters interchange and local road upgrades.

The construction haulage routes presented in the EIS are intended to be used for all construction traffic generated by the project and have been assessed on that basis. However, there is potential that short term alternative routes may need to be considered on an ad-hoc basis as a result of incidents and emergency situations (including road blockages or closures outside the direct control of the project) or to accommodate restrictions associated with construction programming (for example, staging of activities in and around construction sites). There may also be opportunities for minor changes to traffic circulation patterns as a traffic and noise impact mitigation approach, to provide periods of respite to affected receivers.

Environmental management measures to manage potential construction traffic impacts

Where possible, the project has been designed and planned to avoid and minimise impacts to traffic during construction. For example:

- Construction compounds which provide tunnelling support have been located adjacent to State and National roads to minimise impacts on the local road network

- Construction compounds have been designed to provide off-street car parking facilities to minimise impacts on access and parking for local residents.

Despite this, the project would result in impacts to the road network during construction. Management measures would be implemented to avoid, minimise and / or manage these impacts to the road network. These would include:

- Preparation of a Construction Traffic Management and Safety Plan as part of the Construction Environmental Management Plan, in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups. The Construction Traffic Management and Safety Plan would include the guidelines, general requirements and principles of traffic management to be implemented during construction
- Works that would significantly reduce the performance of the road network would be scheduled for periods of typically lower traffic volumes where feasible and reasonable.

Issue description – level of service around construction compounds

Submissions relating to construction traffic impacts raised issues regarding the level of service of roads, including local roads, around all of the construction compounds associated with the project, and expressed concern that the decline in level of service along these roads has not been appropriately addressed in the EIS.

Response

The level of service along the majority of roads around the construction compounds would generally not reduce during both the AM and PM periods. The assessment of construction traffic impacts did identify some roads on which the level of service would decline slightly – this would be expected to result in a minor increase in delays along these roads during the peak periods.

However, the construction traffic and transport impact assessment summarised in Section 9.3.1 of the EIS concluded that additional construction traffic would lead to a relatively small percentage increase I total traffic volumes, having regard to background traffic and traffic growth on the surrounding strategic road network. Construction of the project would therefore have a minor, temporary impact on the performance of the road network around the surface works.

A detailed summary of potential impacts to the level of service of roads which would be used by construction traffic is provided below.

Western surface works, Kingsgrove surface works and Bexley surface works

During construction, road performance is generally expected to operate at LoS D or better during the AM and PM peak periods, with the exception of the following roads which would operate at a LoS E during periods of peak construction:

- The M5 East Motorway (surface lanes) between King Georges Road and Bexley Road during the AM peak in both directions
- The M5 East Motorway tunnel (eastbound), east of Bexley Road during the AM peak
- King Georges Road (northbound) between the M5 East Motorway and Moorefields Road during the AM peak
- Moorefields Road (eastbound), east of Chapel Street during the AM and PM peak
- Moorefields Road (westbound), east of Chapel Street during the PM peak.

Only one road (the M5 East Motorway tunnel eastbound from Bexley Road) would deteriorate from a LoS E to a LoS F in 2016 (AM peak) with the addition of project construction traffic. This road is already anticipated to be very close to capacity in 2016, even without the addition of project construction traffic.

The Construction Traffic Management and Safety Plan would include the guidelines, general requirements and principles of traffic management to be implemented during construction, including specific provisions to manage potential impacts on the M5 East Motorway eastbound as a result of the western surface works.

Arncliffe surface works

Without construction, the performance of roads around the Arncliffe surface works area are generally expected to operate at a LoS D or better during the AM and PM peak, except:

- West Botany Street (northbound) between Marsh Street and Wickham Street, which would operate at a LoS F during the AM peak
- West Botany Street (eastbound) between the M5 East Motorway and Flora Street, which would operate at a LoS E during the AM peak.

Construction of the project would not change the level of service along key roads around the Arncliffe (C7) construction compound however, a minor increase in the volume / capacity ratios along these roads would be experienced.

St Peters interchange and local road upgrades surface works

With construction, road performance is generally expected to operate at a similar level of performance to the road network without constriction traffic. Road performance would generally operate a LoS D or better during the AM and PM peak, except:

- Campbell Road (eastbound), east of the Princes Highway, which would continue to operate at a LoS F during the AM peak
- The Princes Highway (northbound), south of Canal Road, which would operate at a LoS F during the AM peak
- The Princes Highway (southbound), which would continue to operate at a LoS E during the PM peak
- Canal Road (westbound), between the Princes Highway and Burrows Road which would operate at a LoS E during the PM peak. Construction traffic would comprise less than four per cent of traffic along Canal Road at this location. However, the additional traffic would reduce the road performance from a LoS D without construction traffic to a LoS E with the addition of construction traffic.

As described in Section 9.4 of the EIS (as revised in **Chapter 8** (Revised environmental management measures) of this report, a Construction Traffic Management and Safety Plan would be prepared as part of the Construction Environmental Management Plan, in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups.

The Construction Traffic Management and Safety Plan would include the guidelines, general requirements and principles of traffic management to be implemented during construction, including specific provisions to manage potential impacts of construction traffic on local roads around the construction compounds.

The Construction Traffic Management and Safety Plan 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 *AS1742.3: Manual of uniform traffic control devices – Part 3:Traffic control for works on roads*. It would seek to minimise delays and disruptions, and identify and respond to any changes in road safety as a result of construction works.

5.8.4 Impact on public transport and emergency services during construction

No issues raised in community submissions were categorised under 'impact on public transport and emergency services during construction'.

5.8.5 Impacts on pedestrians and cyclists during construction

14 submitters have raised concerns regarding impacts on pedestrians and cyclists during construction.

Issue description – pedestrian safety and connectivity during construction

Submissions have raised concerns relating to the potential impact of construction traffic on the safety of pedestrians on inner Sydney residential streets. Submissions made specific reference to the

impacts on the safety of schoolchildren and elderly residents. Submissions have also raised concerns regarding severance to pedestrian and cyclist connectivity during construction.

Response

As described in Section 6.6.2 of the EIS, a number of pedestrian and cyclist diversions would be put in place during construction to protect community safety, including school children and elderly people. These diversions would involve eliminating, where possible, potential interactions between pedestrians and heavy vehicles at site access points and providing alternative pedestrian access around the construction ancillary facilities.

These would include:

- Western surface works:
  - The existing shared path within Beverly Grove Park to the north of the M5 East Motorway would be permanently realigned so that it is to the north of the Kingsgrove North construction compound (C1)
  - The shared path within Beverly Grove Park to the south of the M5 East Motorway would be closed for the duration of construction due to space constraints. Pedestrians and cyclists would be diverted onto the northern path via Karingal Street and the Kindilan underpass. Pedestrian and cyclist access via the Kindilan underpass would generally be maintained during construction and would be physically separated from construction traffic to maintain safe access
  - The Kindilan underpass would be closed for around four weeks (subject to weather) during construction to accommodate its extension, and would require additional intermittent closures. In instances where the underpass is closed, pedestrians and cyclists would be diverted to Karingal Street and Coolangatta Road for access between the southern and northern paths
  - The M5 East Motorway has been permanently closed to cyclists between Belmore Road and Bexley Road as part of the King Georges Road interchange upgrade. At the completion of construction of the New M5, cyclists would be able to cycle along the M5 South West Motorway from King Georges Road westwards. From King Georges Road eastwards, cyclists have been diverted onto the shared paths within Beverly Grove Park and / or surrounding local roads.
- Local road upgrades:
  - The Bourke Road cycleway would be temporarily diverted around the construction works due to space constraints
  - Pedestrian and shared path facilities in areas subject to local roads upgrades would be relocated or temporary access paths would be constructed to maintain access throughout construction
  - Concrete barriers would be installed to separate pedestrians, cyclists and the general public from construction activities where a haul road is in close proximity to a pedestrian access.

Pedestrian and cyclist access and connectivity would be maintained where possible throughout construction. Where not feasible using existing access, alternate routes would be provided and communicated to the community. Pedestrian and cyclist movements around construction ancillary facilities would be managed in accordance with a Construction Traffic Management and Safety Plan to be prepared in consultation with the relevant road authority, local councils, emergency services, road user groups, and pedestrian and bicycle groups.

The Construction Traffic Management and Safety Plan would include measures to ensure pedestrian safety is maintained during construction. This includes selecting site compound access and egress points which avoid school children pedestrian access routes.

Pedestrian facilities on local roads that are not mentioned in the EIS would not be modified and as such a decrease in pedestrian safety is not anticipated.

Issue description – access to Kingsgrove station

A submission has questioned whether resident's access to Kingsgrove train station would be maintained at all times during the construction of the project.

Response

Pedestrian and cyclist access to Kingsgrove Station would be maintained at all times during the construction of the project.

5.8.6 Traffic safety during construction

Four submitters have raised issues regarding traffic safety during the construction period.

Issue description – increased risk of accidents during construction

Submissions have raised concerns about an increased risk of accidents occurring during the construction of the project because of the increased presence of heavy construction vehicles. Submissions made specific mention of:

- Moorefields Road, including:
  - An increased risk of accidents for vehicles when wanting to turn onto Moorefields Road from adjacent streets
  - An increased risk of accidents due to construction vehicles speeding and / or driving over instead of around the roundabouts along this road.

Response

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. The potential for construction traffic to significantly increase the likelihood of incidents is therefore low.

Section 5.8.3 of this report explains the forecast potential impacts of construction traffic on network performance along Moorefields Road.

The minor contribution of project related traffic to the existing road network around the Kingsgrove surface works would result in an increase in delays for vehicles wanting to turn onto Moorefields Road. However, in the context of the existing traffic volumes along Moorefields Road, this increase is forecast to be slight and would not significantly increase the risk of traffic incidents along this route.

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 Section 9.4 of the EIS (as revised in **Chapter 8** (Revised environmental management measures) of this report. These would include:

- A Construction Traffic Management and Safety Plan would be prepared as part of the Construction Environmental Management Plan. It would include the guidelines, general requirements and principles of traffic management to be implemented during construction, including:
  - Signage requirements (e.g. temporary speed restrictions, changes to the road environment, traffic management controls)
  - Lane possession and approval process during periods of online construction (e.g. line marking and temporary barriers)
  - Traffic control devices such as traffic signals
  - A local and regional communications strategy, including methods to provide advanced notice of any major or prolonged impacts (e.g. leaflets and local media), and real-time information regarding current impacts (e.g. variable message signs, radio traffic news)
  - Details of both the general approach to be used for access and egress to construction compounds and the specific controls required at specific locations

- Specific provisions required to manage potential impacts to sensitive users, such as schools, child care centres and health facilities.

- The Construction Traffic Management and Safety Plan 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 *AS1742.3: Manual of uniform traffic control devices – Part 3:Traffic control for works on roads*
- A Spoil Management Plan would be prepared with subsequent monitoring of heavy vehicle and haulage routes to ensure compliance and minimise impact on local roads off the arterial road network.

Enforcement of speed limits and compliance with other traffic laws is beyond the scope of the EIS. The Construction Traffic Management and Safety Plan to be prepared for the project would 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.

Issue description – additional safety features for construction vehicles

A submission requested that additional safety features be applied to the operation of construction vehicles for the project.

Response

The implementation of additional safety features on construction vehicles for the construction of the project would be at the discretion of the contractor.

5.8.7 Impacts on local roads (e.g. closures) during construction

589 submitters have raised issues regarding impacts on local roads during construction.

Issue description – impacts to parking around St Peters and Mascot during construction

Submissions have raised concerns about parking around the construction compounds and the construction sites. Specific concerns included:

- The loss of 691 car parking spaces on local streets in St Peters and Mascot
- Parking provisions for construction workers would be insufficient and would further impact on the parking deficit in this area
- Environmental management measures relating to parking during construction would not adequately mitigate the potential impacts
- Parking in the area around the St Peters interchange is already inadequate to cater for increased demand associated with urban redevelopment. The project impacts on parking during construction would amplify this
- Concern that construction workers would use the private road at the back of the terrace houses adjacent to Sydney Park (accessed via Harber Street at St Peters), impacting on the ability for residents and visitors to these terrace houses to park along this private road. Confirmation was sought as to how construction workers would be discouraged from using this road for parking
- Concerns that the removal of parking around May Street would exacerbate existing parking issues around St Peters
- The management measures used to manage the potential impacts on on-street parking during construction are not sufficiently detailed in the EIS.

Response

Parking spaces around some of the works areas for the project, including in St Peters and Mascot, would be temporarily reduced to allow safe access to the construction compounds and to accommodate construction of the local road upgrades. The indicative temporary changes to on-street parking availability are summarised in Table 9-37 of the EIS.

As described in Section 6.6.1 of the EIS, parking provisions for light vehicles within the construction compounds have been provided which would minimise the impacts on on-street parking. Parking restrictions for construction workers would be considered where feasible and reasonable and would be reinforced through project inductions and toolbox talks. Construction workers would be encouraged to use public transport where possible and consider other modes of transport such as carpooling.

It is unlikely that construction workers would use the private road at the back of the terrace houses along Campbell Road (accessed via Harber Street at St Peters). Parking provisions for up to 260 light vehicles would be provided at the Campbell Road construction compound (C9) on the southern side of Campbell Road and a car park would also be provided at the Sydney Park construction compound (C14) for light vehicles. It is expected that the use of these car parks would be preferred by construction workers traveling to the site by car.

If the project is approved, the Construction Traffic Management and Safety Plan would form part of the Construction Environmental Management Plan and would be prepared in accordance with the relevant conditions of approval. The plan would be developed in consultation with relevant councils, emergency services, road user groups and pedestrian and cyclist user groups.

A car parking strategy for all sites would be developed as part of the Construction Traffic Management and Safety Plan to limit impacts on the surrounding communities, in consultation with local councils and stakeholders.

Issue description – request for detailed plans, including local area traffic management plan

Submissions have requested that detailed plans be provided to residents to allow for consideration of potential impacts. Submissions have also requested that a local area traffic management plan be prepared in consultation with the residents of Lawrence Street and Belmont Street at St Peters.

Response

Plans showing the indicative location and design of all project elements were provided in Chapter 5 of the EIS. These would be confirmed during detailed design.

If the project is approved, the Construction Traffic Management and Safety Plan would form part of the Construction Environmental Management Plan and would be prepared in accordance with the relevant conditions of approval. The plan would be developed in consultation with relevant councils, emergency services, road user groups and pedestrian and cyclist user groups.

Issue description - changes to local roads around St Peters

Submissions have raised the following queries regarding impacts around the St Peters interchange and local road upgrades during construction:

- How traffic would be redirected where lane closures are implemented, during and outside of standard construction hours
- How access to properties along Campbell Road would be impacted
- What impacts there would be to Lawrence Street in Alexandria during construction.

Response

Temporary lane closures may be required to roads around the St Peters and local road upgrades to accommodate:

- The installation of traffic signals, new barriers and road realignments
- Temporary and / or permanent traffic switches.

These lane closures would be temporary and would be undertaken at night within approved times in accordance with a road occupancy licence under the *Roads Act 1993*. Roads temporarily affected by temporary lane closures are summarised in Section 9.3.1 of the EIS.

A Construction Traffic Management and Safety Plan would be prepared for the project, detailing temporary lane closures and including traffic control procedures, signage requirements, construction traffic management requirements of the relevant Roads and Maritime manuals and procedures and Australian Standards.

Construction of the project is not expected to affect access to existing properties along construction traffic routes including Campbell Road at St Peters. However, motorists entering or exiting properties from roads along construction traffic routes may experience minor delays due to the increase in traffic volumes.

Lawrence Street at Alexandria would not be directly impacted during the works. Indicative temporary road closures and diversions during construction are provided in Table 6-22 of the EIS. These would be confirmed during detailed design.

Issue description - construction traffic control around St Peters local roads

Submissions relating to impacts on local roads have recommended that traffic control be implemented at the following locations:

- Unwins Bridge Road at St Peters
- Conway Lane at St Peters, due to temporary closure of the Brown Street / Campbell Street intersection.

Response

Requirement for traffic control measures at Conway Lane and along Unwins Bridge Road would be established during detailed design and would be implemented in accordance with the guidelines and principles to be established in the Construction Traffic Management and Safety Plan to be prepared for the project.

The Construction Traffic Management and Safety Plan would be prepared as part of the Construction Environmental Management Plan in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups.

It would include the guidelines, general requirements and principles of traffic management to be implemented during construction, including specific provisions to manage potential impacts of construction traffic on local roads.

The Construction Traffic Management and Safety Plan 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 *AS1742.3: Manual of uniform traffic control devices – Part 3:Traffic control for works on roads*. It would seek to minimise delays and disruptions, and identify and respond to changes in road safety as a result of construction works.

Issue description – impacts to local roads including closures

Submissions relating to impacts on local roads have raised general concerns regarding delays to road users, including delays resulting from:

- The increases in heavy vehicles along local roads
- Changes to speed limits
- Temporary lane closures.

Response

Traffic modelling for the construction of the project establishes that road users may experience minor delays due to construction related traffic during the peak periods. These delays could manifest through minor increases in queuing times at intersections along construction haulage routes. There would also be the potential that during peak periods vehicles seeking to enter roads being used by construction haulage vehicles from adjacent streets could experience minor delays.

However, these delays would be temporary and minor having regard to the relatively high background traffic volumes along these routes.

Changes to speed limits could result in minor delays, however these changes would be localised and changes to speed limits would be minimised as far as feasible and reasonable.

Undertaking surface works around the St Peters interchange and local road upgrades during the off-peak periods, when the road network is relatively quiet, would minimise potential delay impacts.

As described in Section 9.4 of the EIS (as revised in **Chapter 8** (Revised environmental management measures) of this report, if the project is approved a Construction Traffic Management and Safety Plan would be prepared as part of the Construction Environmental Management Plan in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups.

It would include the guidelines, general requirements and principles of traffic management to be implemented during construction, including specific provisions to manage potential impacts of construction traffic on local roads.

The Construction Traffic Management and Safety Plan 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 *AS1742.3: Manual of uniform traffic control devices – Part 3:Traffic control for works on roads*. It would seek to minimise delays and disruptions, and identify and respond to any changes in road safety as a result of construction works.

Issue description – partial and temporary closure of Florence Street at St Peters

A submission has raised concerns about the partial closure of access to Florence Street at St Peters from Campbell Street and the temporary full closure of Florence Street at St Peters for short periods of time during the construction of the project. The submission was also concerned about the inconvenience this would be to nearby residents.

Response

It is acknowledged that temporary, full and partial closure of roads and lanes around the St Peters interchange and local road upgrades may be an inconvenience to some users of these roads. However, these closures are necessary to ensure that construction works can be completed in the shortest time possible, minimising potential impacts to users of these roads and the road network around St Peters more broadly.

Alternative access to Florence Street would be provided at all times via Unwins Bridge Road. Access to properties around these works would be maintained for the duration of the project.

A Construction Traffic Management and Safety Plan would be prepared for the project, detailing temporary lane closures and including traffic control procedures, signage requirements, construction traffic management requirements of the relevant Roads and Maritime manuals and procedures and Australian Standards.

5.8.8 Cumulative impacts of traffic during construction

65 submitters have raised issues regarding cumulative impacts of traffic during the construction period.

Issue description – cumulative impacts of other construction projects not assessed

Submissions have raised concerns that there had not been an adequate assessment of the potential cumulative construction traffic impacts of nearby developments that would be constructed at the same time as the project. Submissions have claimed that the assessment was cursory and that the modelling and reporting was not sufficiently detailed having regard to the potential impacts. Submissions raised specific concerns about the cumulative construction traffic impacts of the following developments:

- King Georges Road Interchange Upgrade
- WestConnex Stage 1
- Marrickville Metro Shopping Centre Upgrade

- Green Square development
- Mascot Station Town Centre Precent Masterplan
- Wolli Creek redevelopment area.

Response

In accordance with the SEARs for the project, the cumulative traffic and transport impacts of the project, and other developments to be constructed in the vicinity of the project during the project construction period, have been assessed and are summarised in Section 9.3.1 of the EIS. Additional detail regarding cumulative impacts is provided in Chapter 26 of the EIS.

WestConnex program of works

Based on the project construction program (refer to Section 6.4 of the EIS for more detail), there is the potential for the construction of the project to occur at the same time as the construction of other components of the WestConnex program of works.

Construction haulage routes and vehicle access routes would be similar for the western surface works for the New M5 and the King Georges Road Interchange Upgrade Project, given the location and nature of construction. However, most construction work associated with the King Georges Road Interchange Upgrade would be likely to be completed before, or during the early stages of, the construction program for the New M5 western surface works. The potential for significant cumulative heavy vehicle or spoil haulage impacts in this area is therefore low.

Other nearby major projects

The construction of nearby projects has the potential to result in additional construction traffic on the surrounding road network. Other major developments near the project include:

- Extension of the Marrickville Metro Shopping Centre
- Green Square development
- Mascot Station Town Centre precinct
- Wolli Creek redevelopment.

Extension of the Marrickville Metro Shopping Centre received development consent in April 2015. Although the construction program has not been confirmed, it is assumed construction would likely take place during the same period as construction of the project. Traffic from the construction of the extension of the Marrickville Metro Shopping Centre, north-west of Camdenville Park, may contribute to cumulative impacts, most notably during the construction of the St Peters interchange and local road upgrades.

The number of construction vehicles required for the construction of the extension of the Marrickville Metro Shopping Centre is not currently available, and as such, a quantitative assessment of potential cumulative traffic impacts has not been undertaken. While the Marrickville Metro Shopping Centre project would likely result in a localised increase in the number of vehicles, it is likely that the number of vehicles associated with this development would not significantly contribute to overall traffic numbers.

The Green Square Development, Mascot Station Town Centre Precinct Masterplan and Wolli Creek redevelopment area would all be developed progressively in a staged manner and would generally be located away from areas potentially affected by construction of the project. Traffic from these developments is therefore unlikely to contribute substantially to cumulative traffic impacts near the project during construction.

5.8.9 Level and quality of operational traffic assessment

4,170 submitters have raised issues regarding the level and quality of operational traffic forecast and modelling.

Issue description – traffic modelling assumptions

Submissions relating to the traffic assessment have raised concerns about the quality and methodology of the traffic model.

Response

The EIS explains that the operational traffic and transport impacts were evaluated using traffic demand data from the WestConnex Road Traffic Model (WRTM). The model was developed to forecast road traffic demands for the WestConnex projects including the New M5. The WRTM uses the Sydney Strategic Transport Model (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. The WRTM also models driver behaviour to toll strategies and forecasts traffic choice between toll and non-toll routes during peak and inter-peak periods.

The WRTM model was developed and calibrated to current observed survey data (traffic counts collected in 2012), then validated against 2012 Sydney-wide travel behaviour link flows and travel time comparisons. A key input into the model also includes Value of Travel Time Surveys (VTTS) which has been adjusted to reflect driver behaviour and their willingness to pay on toll roads. Future demand was forecast by applying the model with future year traffic growth assumptions from the STM.

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 forecasts and the traffic forecasts. The independent review committee included independent experts from the Sydney University Institute of Transport and Logistics Studies who are recognised experts in the field of toll road patronage forecasting and transport behavioural choice modelling.

Traffic modelling for the project has relied on population and employment data from the Bureau of Transport Statistics (BTS), which is the best information currently available. These projections were based on the Department of Planning and Environment's future population and employment forecasts (dated September 2014), which has been derived from the 2011 census data and incorporates known major urban renewal and developments, including those around Green Square, Mascot and Wolli Creek. The current WRTM version 2.1 is based on these 2014 land use projections and includes induced traffic demands as well as the proposed airport at Badgerys Creek.

Issue description – assessment of impacts on local roads

Submissions have raised concerns that the operational model was not used to assess the potential impacts on the operational network performance of roads outside the project area, including local roads in the vicinity of project interchanges. Specific concern was raised about the lack of modelling for the roads presented in **Table 5-2**.

Table 5-2 Specific roads raised in concerns about the operational model

Road	Suburb
Edgeware Road	Enmore
McEvoy Street	Alexandria
Campbell Street	St Peters
Euston Road	Alexandria
Lord Street	Newtown
Sydney Park Road	St Peters
Huntley Street	Alexandria
Maddox Street	Alexandria
Mitchell Road	Alexandria
Bourke Road	Mascot
Unwins Bridge Road	St Peters
May Street	St Peters

Response

The extent of the modelling covered the areas forecast to be impacted by the project.

The objective of the operational traffic modelling was to determine the impact of New M5 traffic at the interchanges with the surface roads and therefore the associated roadworks required to achieve acceptable operational performance for the surrounding road network. This modelling took into account 'background' traffic, which is expected to use the road network regardless of whether the New M5 is constructed, plus the incremental additional traffic related specifically to the New M5. The footprint of the operational model therefore needs to be sufficient to determine the configuration of any project-related roadworks. The footprint adopted for the St Peters interchange was specified by determining at what point on connecting roads the percentage of New M5 traffic was low (so that the majority of traffic on the road is 'background' traffic, rather than 'additional' traffic at that location). This means that any local road upgrades required to accommodate project-related traffic would be within the modelled area.

Issue description – current and future urban development and population growth

Submissions have raised concerns that the traffic model did not incorporate assumptions relating to future urban development and future population growth in Sydney.

Response

Assumptions relating to future urban development and future population growth in Sydney have been incorporated into the WestConnex Road Traffic Model (WRTM) (the strategic traffic model for the project), including assumptions relating to developments at Green Square, Mascot, Wolli Creek and surrounding suburbs.

The WRTM uses the Sydney Strategic Travel Model (STM) to derive base demand, including trip generation, trip distribution and mode choice modules, and incorporates demographic data related to land uses including population, employment and education enrolment projections. These projections were based on the Department of Planning and Environment's future population and employment forecasts (dated September 2014) and data released from the Bureau of Transport Statistics, which has been derived from the 2011 Census data and incorporates known major urban renewal and developments, including those around Green Square, Mascot and Wolli Creek.

The forecast growth in background traffic volumes were then used as the basis for the modelling and assessment of traffic impacts of the project during construction and operation.

Further details regarding the incorporation of predicted background traffic growth as a result of urban and residential development are provided in Section 9.1.3 and Section 9.1.4 of the EIS.

Issue description – forecast traffic projections for tunnel projects

Submissions have raised concerns regarding the traffic projections for tunnels 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 model was developed and calibrated to currently observed traffic survey data (traffic counts collected in 2012), then validated against 2012 Sydney-wide travel behaviour link flows and travel time comparisons. A key input into the model included Value of Travel Time Surveys (VTTS) which has been adjusted to reflect driver behaviour and their willingness to pay on toll roads. Future demand was forecast by applying the model with future year traffic growth assumptions from the STM.

The modelling approach comprises:

- A strategic highway network model of the Sydney metropolitan area including Sydney's motorway network and all major state roads within the network
- Anticipated future land use as a basis for estimating future travel demand for cars and trucks
- Anticipated changes and updates to the road network up until 2031

- Representation of future vehicle travel demand to model varying travel patterns and behaviours
- Explicit modelling of all tolls, existing and future, on the network
- Accommodation of different motorist behaviours including willingness to pay a toll to save travel time.

Further details regarding the traffic projections used for the strategic and operational modelling are provided in the Technical working paper: Traffic and transport (Appendix G of the EIS).

Issue description – quality, independence and adequacy of the traffic modelling

Submissions have raised concerns regarding the quality, independence and adequacy of the traffic model.

Response

The EIS explains that the operational traffic and transport impacts were evaluated using traffic demand data from the WestConnex Road Traffic Model (WRTM). The model was developed to forecast road traffic demands for the WestConnex projects including the New M5. The WRTM uses the Sydney Strategic Transport Model (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. The WRTM also models driver behaviour to toll strategies and forecasts traffic choice between toll and non-toll routes during peak and inter-peak periods.

The WRTM model was developed and calibrated to current observed survey data (traffic counts collected in 2012), then validated against 2012 Sydney-wide travel behaviour link flows and travel time comparisons. A key input into the model also includes Value of Travel Time Surveys (VTTS) which has been adjusted to reflect driver behaviour and their willingness to pay on toll roads. Future demand was forecast by applying the model with future year traffic growth assumptions from the STM.

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 forecasts and the traffic forecasts. The independent review committee included independent experts from the Sydney University Institute of Transport and Logistics Studies who are recognised experts in the field of toll road patronage forecasting and transport behavioural choice modelling.

Traffic modelling for the project has relied on population and employment data from the Bureau of Transport Statistics (BTS), which is the best information currently available. These projections were based on the Department of Planning and Environment's future population and employment forecasts (dated September 2014), which has been derived from the 2011 census data and incorporates known major urban renewal and developments, including those around Green Square, Mascot and Wolli Creek. The current WRTM version 2.1 is based on these 2014 land use projections and includes induced traffic demands as well as the proposed airport at Badgerys Creek.

The traffic and transport assessment undertaken for the EIS provides detailed information on network effects of the New M5, intersection performance and impacts on the local roads around the St Peters interchange, as well as parallel arterial routes which could see increases in traffic volumes due to traffic switching from the M5 East Motorway corridor. The roads and intersections assessed for the EIS were selected as being representative of the impacts on the localities in their immediate vicinity. The impacts of the New M5 were compared to the 'do nothing' scenarios (i.e without the project) to understand the effects and to provide a comparison against the impacts with the project

Future base case traffic conditions and network assumptions are explained in the Technical working paper: Traffic and transport (Appendix G of the EIS).

Issue description – value of travel time savings modelling

Submissions sought additional information regarding the project specific value of travel time savings (VTTS) surveys of drivers' willingness to pay tolls. Responses to the specific queries are provided in **Table 5-3**.

Response

Table 5-3 Queries and responses regarding value of travel time savings modelling

Issue description	Response
The form and parameters of the model have not been given.	The form is a lognormal distribution. The parameters are commercially sensitive information.
If it was based on stated preference surveys, then how has the issue of hypothetical bias been addressed?	The stated preference surveys used to obtain distributions of value of travel time savings were reviewed by international experts during the survey design process.
Has the model been validated? Previous toll choice models in Australia have overestimated WTP for toll roads.	The model has been benchmarked against studies from other projects in Australia and internationally.
Does it include the negative utility of the tunnel environment (monotony, no natural light, poor air quality)?	These are not features of the New M5.
Does the WTP estimate take into account tolls that motorists currently pay (toll saturation)? For example, a road user may be willing to pay an additional $10 / day if he / she currently pays nothing, but not willing to pay an additional $10 if he / she is already spending $15 on tolls.	This is an area of preliminary academic investigation and neither the effects nor algorithms to model these effects have been demonstrated. There are a number of people in other parts of Sydney who already use multiple toll roads.

Issue description – sensitivity of findings to traffic modelling

Submissions have raised concerns regarding that the introduction of tolling to the existing M5 East Motorway (in addition to tolls on the New M5) would significantly contribute to traffic problems (including congestion) along parallel routes. Submissions asserted that the effects of varying assumptions (i.e. willingness to pay tolls) had not been described or assessed in the EIS.

Response

The project would have an impact on alternative un-tolled surface routes (or parallel routes) as part of the project, and the EIS considers these potential impacts. As noted, changes to traffic, including behavioural aspects due to tolling, have consequential air quality and health impacts. Development of the traffic model included a number of activities, including behavioural studies for toll-related behaviour, and peer review. Efforts were focused on reducing the uncertainty associated with the traffic modelling, as detailed below.

As discussed in Section 9.2 of the technical working paper: Traffic and transport (Appendix G of the EIS), traffic is forecast to divert off the motorway network to other routes outside the peak traffic periods to avoid the motorway toll. This shift in traffic distribution is not anticipated to have a significant impact from a traffic perspective (in terms of congestion) as there is generally network capacity to accommodate the additional, redistributed traffic in these off-peak periods. The project does not seek to augment the existing road as a result of this redistribution of traffic.

The EIS assesses the changes in air quality as a result of redistribution of traffic from the motorway network to the surrounding surface road network, and concludes that for much of the community this would result in no change or a small improvement (i.e 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 nitrogen dioxide and particulates) within the local community have been assessed and are considered to be acceptable (refer to Section 15.3.2 of the EIS).

The WestConnex Road Traffic Model (WRTM) uses current best practice methods for representing drivers' behaviour with respect to their willingness to pay tolls for road travel time savings for multiple toll roads and routes through the Sydney metropolitan network. The toll choice model was developed for the WestConnex project as an augmentation of standard traffic route modelling procedures that are normally used in planning and assessment of un-tolled roads. The toll choice model addresses private vehicle and commercial (truck) traffic behaviour, representing the different willingness of these vehicle users to pay for travel time savings in the context of total journey costs including tolls, travel times and distances available on competing routes.

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 WRTM's route choice algorithm to represent the influence of a toll.

The current tolls on all tolled roads in the Sydney metropolitan area are incorporated into the model. The model also considers future changes in perceived value of tolls taking into account escalation of tolls, effects of inflation and average weekly earning projections. The traffic modelling was independently peer reviewed by a committee including David Johnston of Johnston Services Pty Ltd and Professor David Hensher of University of Sydney Institute of Transport and Logistics Studies who are recognised experts in the field of toll road patronage forecasting and transport behavioural choice modelling.

The traffic forecasts produced by WRTM are dependent on a number of input assumptions, such as Sydney's future population and its distribution across the city. WRTM uses the current NSW State Government population forecasts. Therefore, given these input assumptions and given the robust approach in developing the toll choice model, the most practical way to manage the risk of estimation of the traffic impacts is through the use of observed data.

To do this it is proposed that on select routes deemed likely to be subject to toll avoidance (ie. alternative un-tolled parallel routes to the New M5), a number of locations along the length of the routes would have additional traffic data collected both prior to opening, 12 months after opening of the New M5. This observed traffic flow data would reflect actual driver route choice associated with the New M5 and tolls. The collected data would identify both light and heavy vehicles and enable comparison with forecast traffic flows. The new observed data would be used to monitor the impacts on the parallel routes relative to that predicted in the EIS.

Should this data reveal changes associated with actual driver route choice to be sufficient to explore management measures, Roads and Maritime would develop such interventions as are necessary and that these measures would themselves be subject to the necessary approvals processes.

Issue description – Technical queries of traffic model

Submissions have queried various technical aspects of the traffic model.

Response

The queries made by submissions and a response to each individual query are provided in **Table 5-4**.

Table 5-4 Technical queries relating to the traffic model

Issue description	Response
Assessment Methodology (EIS Appendix G, Section 4.4.2)	
There has been no long-term evaluation / verification of the methodology used to forecast induced demand (New Zealand Transport Agency Economic Evaluation Manual (EEM)). Induced demand by its nature materialises over several years and without a long-term evaluation / verification of the methodology, there can be no confidence in the induced demand forecast produced.	Induced demand is an important aspect of the evaluation of major road projects. The New Zealand Transport Agency Economic Evaluation Manual methodology is state of practice and represents a significant improvement on evaluation procedures used for major road project proposals in NSW and Australia. The process was developed by international experts for the NZ Transport Agency. Roads and Maritime furthermore requested an independent peer review to be undertaken by Australian academic experts who verified the robustness and suitability of this process for application to the New M5 and other WestConnex projects.
The transport model (WRTM) has not been made available for independent verification.	The WRTM contains commercially sensitive information and is not publicly available. The WRTM has been reviewed by independent experts who have verified its suitability for use in the Government's planning investigations.
The model input data and assumptions have not been made available for independent verification. What toll prices have been assumed?	Toll levels for WestConnex projects have been determined based on the NSW State government toll principles as set out in the Updated WestConnex Strategic Business Case (November 2015). Generally, the tolls are lower (per kilometre) than other inner urban toll roads in Sydney and therefore minimise diversion relative to other toll roads.
The study area is too small to capture all the transport impacts of the project. The project would affect transport demand and behaviour across the whole metropolitan area.	The study area for traffic demand within the EIS is the whole of the Sydney Metropolitan area. The objective of the operational traffic modelling is to determine the impact of New M5 traffic at the interchanges with the surface roads and therefore the associated roadworks required to achieve acceptable operational performance for the surrounding road network. This modelling takes into account 'background' traffic, which is expected to use the road network regardless of whether New M5 is constructed, plus the incremental additional traffic related specifically to New M5. The footprint of the operational model therefore needs to be sufficient to determine the configuration of any project-related roadworks. The footprint adopted for the St Peters interchange was specified by determining at what point on connecting roads the percentage of New M5 traffic was low (so that the majority of traffic on the road is 'background' traffic, rather than 'additional' traffic at that location). This means that any local road upgrades required to accommodate project-related traffic would be within the modelled area.

Issue description	Response
Insufficient detail on the Value of Travel Time Saving (VTTS) / Willingness to Pay (WTP) model:	Response to specific issues regarding the VTTS and WTP model provided below.
What are the form and parameters of the model?	The form is a lognormal distribution. The parameters are commercially sensitive information.
If it was based on stated preference surveys, then how has the issue of hypothetical bias been addressed?	The stated preference surveys used to obtain distributions of value of travel time savings were reviewed by international experts during the survey design process.
Has the model been validated? Previous toll choice models in Australia have overestimated WTP for toll roads.	The model has been benchmarked against studies from other projects in Australia and internationally.
Does the model include the negative utility of the tunnel environment (monotony, no natural light, poor air quality)?	These are not features of the New M5.
What value of WTP has been used in the WRTM?	A distribution rather than a point estimate is used. The parameters of the function are commercially sensitive information.
What is the confidence interval around the WTP value used?	A lognormal distribution is used. Different users have different willingness to pay.
Does the WTP estimate take into account tolls that motorists currently pay (toll saturation)? E.g., a road user may be willing to pay an additional $10 / day if he / she currently pays nothing, but not willing to pay an additional $10 if he / she is already spending $15 on tolls.	This is an area of preliminary academic investigation and neither the effects nor algorithms to model these effects have been demonstrated. There are a number of people in other parts of Sydney who already use multiple toll roads.
Why has the weekend period not been modelled, when current weekend traffic volumes are higher than weekday traffic volumes in some places?	In the vast majority of locations in Sydney weekday traffic volumes are higher than weekend volumes, with very few if any exceptions. This is consistent with the common practice in major Australian cities.
There is insufficient information about the travel zone structure in the Westconnex Road Traffic Model (WRTM)	Zones are Transport for NSW Bureau of Transport Statistics TZ06 definition. There are 2,123 travel zones in WRTM including 10 external zones.
What are the travel zones based on? How big are they?	Bureau of Transport Statistics TZ06 definition, derived from analysis of Australian Bureau of Statistics boundaries. These are available at: www.bts.nsw.gov.au/Statistics/Spatial/default.aspx#tab2
How are intra-zonal trips modelled?	Produced by Sydney Strategic Travel Model. See technical documentation at: www.bts.nsw.gov.au/Statistics/Travel-Forecasts/Travel-Forecasts/default.aspx#tab4
How are trips to / from external zones modelled?	Cordoned from the Sydney Strategic Travel Model which covers a wider geography than WRTM.

Issue description	Response
Induced demand has not been adequately addressed	The process for induced demand represents the state of practice. WestConnex is the first major road project in NSW to formally assess induced demand; this represents a major improvement to planning for this project.
The model ignores the impact of the project on the long-term transport decisions of individuals and firms, including:	Land-use / transport interaction models to estimate these effects are not available for application to this project, and are not used in NSW, Australian or most overseas countries for road planning practice.
Residential location choice – the project would encourage more people to move further from work (sprawl), thereby increasing average travel distances / demand.	
Work location choice – the project would encourage more people to work further from home, thereby increasing average travel distances / demand.	
Car ownership choice – the project would encourage more car ownership and use.	
Firm location choice – the project would encourage firms to locate in locations further away from their labour supply / customers / suppliers than they otherwise would, thereby increasing travel distances / demand.	
There is insufficient detail on origin-destination demand matrix generation:	Refer to Sydney Strategic Travel Model. See technical documentation at: www.bts.nsw.gov.au/Statistics/Travel-Forecasts/Travel-Forecasts/default.aspx#tab4
What are the form and parameters of the generalised cost function?	
How were shortest paths calculated?	
Insufficient detail on trip generation:	Refer to Sydney Strategic Travel Model. See technical documentation at: www.bts.nsw.gov.au/Statistics/Travel-Forecasts/Travel-Forecasts/default.aspx#tab4
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?	
Insufficient detail on trip distribution/modal split:	Produced by Sydney Strategic Travel Model. See technical documentation at: www.bts.nsw.gov.au/Statistics/Travel-Forecasts/Travel-Forecasts/default.aspx#tab4
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?	
Insufficient detail on road traffic assignment:	Responses to queries regarding road traffic assignment details provided below.
Is assignment stochastic or deterministic?	Deterministic.
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.
Were intersection delays included?	Yes.

Issue description	Response
Insufficient detail on public transport assignment:	Responses to queries regarding public transport assignment details provided below.
How were access and egress points determined?	Produced by Sydney Strategic Travel Model. See technical documentation at: www.bts.nsw.gov.au/Statistics/Travel-Forecasts/Travel-Forecasts/default.aspx#tab4
How were route strategies determined?	
Non-motorised trips (pedestrians, cyclists) were not included in the WRTM or LinSig modelling. (LinSig is a traffic modelling package for the assessment and design of traffic signal intersections, either individually or as a network that comprises of a number of intersections.)	Non-motorised trips are estimated by Sydney Strategic Travel Model. See technical documentation at: www.bts.nsw.gov.au/Statistics/Travel-Forecasts/Travel-Forecasts/default.aspx#tab4
Impacts on accessibility have not been modelled/ assessed.	Non-motorised travel is forecast by the Transport for NSW Sydney Strategic Travel Model which provides the source for future growth in travel demands in Greater Metropolitan Area of Sydney. Pedestrian and bicycle travel times have not been modelled. 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 5.8.11** of the report.
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 would make work, education and services more accessible
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). Refer to **Section 5.3.3** of this report for further detail. Free, alternative traffic routes would remain available to those who choose not to or cannot afford to use the tolled motorway.
How many people have better accessibility with the project?	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 5.8.11** of the report.
How many people have poorer accessibility with the project?	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 5.8.11** of the report.

Issue description	Response
Do benefits/impacts accrue to any population groups more than others, e.g., people with a disability or on low incomes?	Traffic modelling indicates that some motorists could choose to use alternate parallel routes, such as King Georges Road, Stoney Creek Road, Forest Road and Canterbury Road, instead of the M5 East Motorway corridor. This diversion of traffic onto arterial roads to avoid the toll is most likely to occur outside peak traffic periods, when there is generally spare capacity across the network. During peak periods these arterial roads are already at capacity and there is less incentive to divert from the motorway to avoid the toll. Free, alternative traffic routes would remain available to those who choose not to or cannot afford to use the tolled motorway.
Downs-Thomson Paradox is not considered The project would attract passengers away from public transport to driving. As such, public transport patronage would be lower than it would be without the project. This could result in public transport service levels being cut, which would encourage further mode shift from public transport to road.	Improved travel times on surface roads would lead to more reliable public transport (bus) services.
No sensitivity analysis. Given the numerous assumptions and approximations in the model, there needs to be some sensitivity analysis, e.g. How would traffic volumes be affected if (when) the WTP for the toll turns out to be lower than the point estimate used?	The modelling provides a case suitable for planning investigations. Willingness to pay is not modelled as a point estimate, but as a lognormal distribution.
Assessment Methodology (EIS Appendix G, Section 8 – Future conditions without the project)	
Tables 69, 70, 74, 75, 77 and 78 do not include the base year (2012) values, so the future 'do minimum' scenarios cannot be compared with current conditions.	The base year values are presented earlier in the report. They were not repeated again as the tables would have become overly large and cumbersome for the reader to use.
Tables 72, 73 and 76 use 2014 as the base year, instead of 2012 as used elsewhere in the EIS. To understand the impacts of the project, a consistent baseline must to be used.	To create a calibrated and validated operational model using Paramics, traffic survey data such as detailed counts, journey times, speeds and queue lengths are required. This information was not available for 2012 at St Peters and therefore new surveys were undertaken in 2014 to collect the information required.
An assessment of the impacts on walking and bicycle demand and travel times has not been provided.	Pedestrian and bicycle travel times have not been modelled. It is not expected that walking or cycling times would be meaningfully altered by the implementation of the project and as such have not been assessed in detail. The impact of pedestrian movements on signal phasing and intersection delays for vehicles has been assessed in the detailed operational modelling. In completing the modelling, pedestrians have been provided equivalent or better priority at signalised intersections throughout the study area.

Issue description	Response
Assessment Methodology (EIS Appendix G, Section 9 – Future year traffic volume and patterns)	
Tables 79, 80, 81 do not include the base year (2012) values, so the future 'with project' scenarios cannot be compared with current conditions.	The base year values are presented earlier in the report and were not repeated again as the tables and figures are comparing the future conditions with and without the project, not comparing them to current conditions
Figures 67, 68, 69, 70, 71, 72 do not include the base year (2012) values, so the future 'with project' scenarios cannot be compared with current conditions.	
Assessment Methodology (General)	
The operational or network performance modelling was conducted using Paramics software yet there is no information about who ran this software, nor what the limitations of the software are.	Section 4.1.3 of the Technical working paper: Traffic and transport (Appendix G of the EIS) provided information on the Paramics software. AECOM developed and ran the St Peters Paramics model.
The input data to the WestConnex model was provided by government agencies and therefore it is not clear that they are suitably independent. This data, (to do with population, employment, road, rail etc. networks, tolls, induced traffic, land use) is all from the Strategic Transport Model (STM). The STM is managed by the Bureau of Transport Statistics. The Bureau of Transport Statistics lies within the Planning and Programs Division of Transport for NSW.	Roads and Maritime Services is the proponent of the project and as a Government agency collaborates with other Government agencies to develop suitable data inputs to inform the Government's planning investigations for the project.
All traffic modelling should consider errors in inputs and provide error estimates of the outputs, yet this has not been done. No error bars are provided.	While error bars have not been provided, errors in inputs / outputs were reviewed through the course of the project, for example the method used for the induced demand analysis was independently reviewed by Professor David Hensher, Director of the Institute of Transport and Logistics Studies at the University of Sydney. Through independent analysis, Professor Hensher verified that the method was sound and specifically calculated that the parameters proposed by the New Zealand Transport Agency Economic Evaluation Manual were appropriate for use in Sydney.

Issue description	Response
The ‘modelled years’ have been chosen specifically as those that represent the best traffic modelling case for the project. The project is defined to be completed by 2019 but modelling uses the years 2021 and 2031 for 10 years after the completion of the project which does not meet RMS guidelines.	The traffic and transport assessment is based on traffic modelling using the WRTM, which is opened and operated by RMS and information passed to SMC in line with Roads and Maritime guidelines. The WRTM relies on forecasts of car driver demand sourced from the Sydney Strategic Travel Model (STM) operated by the Transport for NSW Bureau of Statistics and Analytics. The STM uses projections of population and employment for Sydney and forecasts mode choice between car, rail, bus, light rail and ferry modes for future infrastructure scenarios. Future projections of population and employment for Sydney are produced by DP&E for 5 year intervals (i.e. 2016, 2021, 2026, 2031, etc.) to coincide with national census information. The future year 2021 was used because this is the closest to the opening year and, while the NSW Government has committed to achieving completion of the New M5 Motorway by 2019, using 2021 allows for full ramp-up of traffic demand as travellers respond to the provision of the project. The year 2031 was used as it is closest to the 10 years after the opening year assessment as per standard Road and Maritime approach.
Where it was found that one-hour future demand would exceed road capacity, demand was flattened to allow for a longer peak period - i.e. when modelling results were poor, traffic was ‘spread out’ which is not what would happen in reality.	When road capacity is exceeded, there is a known trend that people change their time of travel or their mode. The mode change would have been taken into account in the STM outputs. The change in time of travel was modelled to account for this 'peak spreading' phenomenon - once the theoretical capacity is reached, no further vehicles can travel through the network.
Is it the case that when the M5 modelling produced poor results a low LoS became a ‘demand management technique’? Was the current situation, with some intersections and road sections operating at a low LoS, ever considered ‘a demand management technique’?	The LoS results are a reflection of the capacity of the intersection. The intersections have been designed to be suitable in size and functionality to the urban context in which they would reside. The predicted LoS has not been considered as a demand management technique.
‘Modelling’ future crashes, the results of which are used as a justification for the project within the report, is based on a simple assumption that ‘future frequency, type, and severity of crashes’ would remain similar. A more detailed and sensitive model might provide a more accurate estimate of future trends	The methodology used to assess traffic crashes is consistent with previous EIS projects. The crash analysis in the St Peters area used the Austroads Road Safety Engineering Toolkit to assess the crash reduction from proposed intersection works that have been shown to be effective in the reducing the likelihood of crashes. Therefore, the future frequency has been changed to reflect the changes. The crash analysis for the M5 East Motorway has used similar rates to the historic data, which is a conservative approach, while that for the New M5 has used rates from other Sydney motorway tunnels.

Issue description	Response
The report also states that crashes would decrease due to reduced congestion as a result of the project (Appendix G, p. 241-242), however no estimations are made regarding whether each crash that does occur would be more damaging, expensive and deadly due to higher speeds and changed traffic conditions	The methodology used to assess traffic crashes is consistent with previous EIS projects. In addition, the approach was to develop and compare indicative crash rates for the 'with project' and 'without project' scenarios. Consequently, the assessment is based on parameters that are common for both scenarios and identified crash benefits of the New M5 are relative to statistics without the project. Statistics are based on Roads and Maritime guidance for assessing the economic impact of road incidents.
The model in Chapter 4.1 (Appendix G 'Future Year Traffic volumes and patterns') is completely flawed. It does not seem to contain any economic, financial, budgetary, environmental or energy supply parameters, let alone limitations or boundary conditions.	Chapter 4.1 of the Technical working paper: Traffic and transport (Appendix G of the EIS) provides an overview of the three-stage traffic forecasting and modelling approach that has been adopted for the traffic demand, operational and construction traffic assessment. It provides detail of current traffic demand, how this demand would change, and how traffic demand is reflected in terms of road performance. The Technical working paper: Traffic and transport (Appendix G of the EIS) is not intended to respond to economic or budgetary matters. The EIS presents a balanced merit-based environmental impact assessment in accordance with the EP&A Act, the SEARs and applicable NSW assessment policies.
Concern that traffic modelling used toll plaza transaction rather than Cross City Tunnel data for analysis.	The traffic data used in the WRTM model included traffic count data at the Cross City Tunnel toll plaza. Transaction data was not used.
Euston Road incorrectly categorised as LoS A during morning peak – should be LoS D	The submission offers an opinion that the level of service on Euston Road is less than reported in Table 99 and Table 100 of the Technical working paper: Traffic and transport (Appendix G of the EIS). The level of service information in these tables was derived from the operational traffic modelling. The model was calibrated using traffic count and journey time data collected in 2014. The operation of the model was then subject to review by staff from Roads and Maritime Network Operations teams to confirm that it accurately reflected observed conditions on the road including queueing and delay were appropriate.

Issue description	Response
Stopping the total model coverage just before the Bedwin Road bridge over the railway appears to be too convenient and an attempt save the extra millions of dollars it would be probably cost to upgrade the bridge to provide an adequate and safe pedestrian environment and correct the pinch point where Bedwin Road turns in to Edgeware Road.	The objective of the operational traffic modelling is to determine the impact of New M5 traffic at the interchanges with the surface roads and therefore the associated roadworks required to achieve acceptable operational performance for the surrounding road network. This modelling takes into account ;background' traffic, which is expected to use the road network regardless of whether New M5 is constructed, plus the incremental additional traffic related specifically to New M5. The footprint of the operational model therefore needs to be sufficient to determine the configuration of any project-related roadworks. The footprint adopted for the St Peters interchange was specified by determining at what point on connecting roads the percentage of New M5 traffic was low (so that the majority of traffic on the road is 'background' traffic, rather than 'additional' traffic at that location). This means that any local road upgrades required to accommodate project-related traffic would be within the modelled area.

Issue description – modelled tunnel lane configuration

Submissions raised concern about which lane configurations had been modelled in the EIS. Issues raised in submissions included:

- Concerns that tunnels between King Georges Road and Bexley Road and Arncliffe are being built as three lanes but the EIS has indicated only two lanes of traffic have been modelled
- Concerns that tunnels between Arncliffe and St Peters are being built as five lanes but the EIS has indicated only two lanes of traffic have been modelled
- A query as to what lane configuration had been modelled for the 2031 scenarios.

Response

Table 5-5 presents the number of lanes which have been modelled under each future year scenario.

Table 5-5 Number of modelled lanes for each future year scenario

Modelled scenario	Number of lanes
2021 'with project'	Two lanes in each direction
2031 'with project'	Two lanes in each direction
2031 'full WestConnex and Southern extension'	Two lanes in each direction - between the western portals (east of King Georges Road) and the Southern Connector interchange. Four lanes – northbound between the Southern Connector interchange and the St Peters interchange. Three lanes – southbound between the St Peters interchange and the Southern Connector interchange.

The mid-block operational performance summary for the New M5 for each of these scenarios is presented in Table 85, Table 86 and Table 87 respectively in the Technical working paper: Traffic and transport (Appendix G of the EIS).

Issue description – use of level of service in the EIS

Submissions raised concern about how the term level of service was used in the EIS. Concerns included:

- Levels of service and volume to capacity ratios were advised to be only used as 'a comparison, or indication of change between scenarios, rather than absolute values'—yet throughout the document these are used as if they are certainties
- The colour representation of different Levels of Service in tables was misleading in the EIS as the colour green was used for a Level of Service of 'D'.

Response

The quoted text was referenced in connection with the M5 East, where existing peak period flows were affected by downstream congestion, which affected the LoS and v/c ratios. Comparisons were provided between LoS or v/c ratios for the 'with project' and 'without project' scenarios to illustrate the project impacts. Level of service (LoS) is a qualitative measure used to describe the operational conditions and efficiency of a road or intersection and to assess operational performance. Typically, when the level of service of a road or intersection falls below a level of service D, investigations are generally initiated to provide suitable remediation.

For this reason it is not considered misleading to use the colour green for level of service D or better.

Issue description – request for further modelling and requests for details regarding information at Campbell Street

A submission requested specific details be provided for traffic impacts to Campbell Street including:

- Traffic volumes

- Impacts to property access
- Waste and recycling collection
- Changes to parking conditions
- Whether current restrictions on turning left into Brown Street from Campbell Street would be maintained.

Response

Traffic volumes would increase along Campbell Street (between Unwins Bridge Road and the Princes Highway) as a result of the widening of this section of the road to two traffic lanes in each direction. The widening of the road would provide the required additional capacity along Campbell Street to cater for the forecast increase in traffic volumes along this road resulting from the St Peters interchange as well as locally generated trips.

The intersections of Campbell Street / Princes Highway and Bedwin Road / Campbell Street / Unwins Bridge Road / May Street would also be upgraded.

In 2021 and 2031, intersection level of service for the Bedwin Road / Campbell Street / Unwins Bridge Road / May Street would continue to operate at a LOS D or better under the 'with project' scenarios.

Without the project, modelling indicates that in the 2031 PM peak this intersection would degrade to a LoS F, indicating that without the WestConnex full program of works and the future Southern Connector augmentation of this intersection would be necessary to accommodate the predicted background growth in traffic demand along these roads.

The performance of the intersection of Princes Highway / Campbell Street would decline slightly as a result of the project during the 2021 and 2031 AM peak and the 2021 PM peak. The most significant decline would be in the 2031 AM peak where this intersection would operate at LoS F compared to LoS D without the project.

In 2031 during the PM peak, a minor improvement would be expected at this intersection (LoS E compared to LoS F under the 'without project' scenario).

An operational traffic review would be conducted 12 months following the commencement of operation to confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections. The operational traffic review would be undertaken by a suitably qualified traffic specialist that is independent of the design and traffic studies undertaken as part of the Environmental Impact Statement. The operational traffic review would include (but is not limited to) an assessment of the level of service at major intersections on local roads around the St Peters interchange, the King Georges Road interchange and changes in traffic levels on parallel arterial roads, such as Stoney Creek Road. Further discussion of the performance of the roads around the St Peters interchange, including Campbell Street is provided in **Section 5.8.19** of this report.

Some properties along Campbell Street would require property access adjustments as a result of the local road upgrades. These impacts are described in Table 13-9 of the EIS. The property adjustments would consist typically of driveway adjustments / extensions to suit the realignment of Campbell Street. The nature of these adjustments would be confirmed during detailed design.

The project would not impact on waste and recycling collection along Campbell Street.

There is currently no on-street parking provision along Campbell Street. Impacts to parking along this road would therefore be negligible. Impacts to on-street (and some off-street) parking around the St Peters interchange are described further in **Section 5.8.16** of this report.

The Brown Street / Campbell Street intersection at St Peters would provide for left-in, left-out (westbound) turning provisions only. It not envisaged that the existing turning restrictions from Campbell Street into Brown Street would be removed as part of the project.

Issue description – modelling of right turns

A submission raised concern that traffic modelling depended on the restriction of right turns from Mitchell Road into Euston Road and from the Princess Highway into May Street. The submission was concerned that these restrictions may be implemented and if the restrictions did not occur, that this would be a flaw in the traffic modelling.

Response

The local road upgrades included as part of the project are detailed in Section 5.7 and shown on Figures 5-29 to 5-36 of the EIS. The project does not include works at the intersection of May Street and the Pacific Highway, or at the intersection of Mitchell Road and Euston Road.

The movement restrictions at the intersections of Sydney Park Road / Mitchell Road intersection and Princes Highway / May Street intersection have been included in the traffic modelling to minimise vehicles taking short cuts through the network. These movements are relatively minor when compared to the total volumes and movements throughout the entire modelled network and do not have a significant effect on the overall model performance but demonstrate a worst case scenario where the movements maybe restricted.

As part of its ongoing responsibilities to manage the performance of the road network, Roads and Maritime is still separately considering upgrades at some locations near the New M5 local road upgrade works. When considering these intersections Roads and Maritime would undertake modelling to inform a final decision.

5.8.10 Impact on network performance during operation

4,828 submitters have raised issues regarding the performance of the road network during operation.

Issue description – operational performance (congestion)

Submissions raised general concerns relating to the operational road network performance with the project.

In summary, the submissions raised the following issues:

- General concern that the project would not assist in resolving Sydney's traffic congestion issues
- General concern that the project would increase congestion
- Concern that the project would exacerbate traffic congestion by directing traffic onto the local road network. Submissions raised specific concerns regarding traffic congestion on roads within specific suburbs, including St Peters, Alexandria, Newtown, Mascot, Kensington, Green Square, Erskineville, Ashmore, Redfern and Zetland
- Concern that Euston Road would not have sufficient capacity to handle 61,000 cars and that the project would lead to the congestion of Euston road and subsequent rat-running into local roads
- The project would increase congestion along the Princes Highway and Wickham Street at Arncliffe, and on residential streets around Arncliffe Public School.

Response

Once completed, the project would provide immediate benefits in relieving congestion along the M5 East Motorway corridor between King Georges Road at Kingsgrove in the west and Foreshore Road at Botany in the east. This would ensure greater accessibility between Sydney's south-western suburbs with the Sydney CBD as well as the Sydney Airport and Port Botany. With the whole WestConnex program of works, travel times on the M5 East would reduce by up to 47 per cent in 2031 and travel speeds would be up to 45 kilometres an hour faster than without the project.

The New M5 would also operate at an improved level of service (a qualitative measure used to describe the operational conditions and efficiency of a road or intersection and to assess operational performance) compared to the current road network, and would ultimately provide connectivity to the future M4–M5 Link, and the possible future Southern Connector (formerly Southern extension) and Sydney Gateway.

Section 9.3.2 and the Technical working paper: Traffic and transport at Appendix G of the EIS include a thorough assessment of the predicted operational traffic impacts of the project on the local and regional road network. The existing traffic and transport environment and the potential traffic and transport related impacts associated with the project, have been described in the context of the two key components of the project:

- The M5 East Motorway corridor (comprising the M5 East Motorway, the main alignment tunnels between the two ends of the project and the St Peters interchange)
- The local roads around St Peters interchange and Sydney Park (comprising the suburbs of Mascot, Eastlakes, Kensington, Kingsford, Erskineville, Alexandria, Newtown and Zetland).

The potential traffic and transport benefits and impacts of the operation of the project, including in relation to congestion are explained in further detail below.

Network performance on the M5 East Motorway corridor

The M5 East Motorway carries more than 100,000 vehicles per day and as a result, motorists experience heavy congestion during most parts of the day, resulting in slow speeds and unreliable travel times. The M5 East Motorway has the slowest typical travel speeds of any of Sydney's main motorways.

As the South West Growth Centre expands and new commercial operations establish along the Westlink M7 Motorway corridor, travel demand along the M5 East Motorway corridor is expected to continue to grow. Without improvements to the capacity of the M5 East Motorway corridor, travel times during the afternoon peak between King Georges Road in Beverly Hills and Foreshore Road in Botany are expected to increase by about 14 minutes by 2031.

The project would provide much needed additional capacity along the M5 East Motorway corridor, easing congestion and providing improved connections to cater for the forecast growth in employment and population along the corridor.

The New M5 would accommodate two-way average weekday traffic (AWT) of around 29,500 vehicles in 2021. Two-way 2021 AWT volumes on the M5 East Motorway are predicted to decrease from about 116,000 vehicles per day at the western end to about 69,000 vehicles and from about 101,500 vehicles per day at the eastern end to about 81,000 vehicles. This equates to daily volume reductions of 40 per cent and 20 per cent at the western and eastern ends of the project respectively. This would be a significant reduction along the existing M5 East Motorway, easing existing congestion issues.

By 2031, the New M5 is predicted to accommodate two-way AWT volumes of about 34,500 vehicles per day under the 'with project' scenario, and about 81,500 vehicles per day with the full WestConnex program of works, the Sydney Gateway and the Southern Connector (formerly the Southern extension). This increase in forecast traffic volumes under the 2031 'full WestConnex and Southern Connector' scenario would be due to traffic heading east / west on the M4–M5 Link and south west / north east on the Southern Connector.

Some of this traffic forecast to use the New M5 would relocate from the M5 East Motorway, which would see a 21 per cent decrease in two-way AWT volumes under the 2031 'WestConnex and Southern extension' scenario. However, the most significant shift would be seen at the eastern end of the project in vehicles using the New M5 instead of the Princes Highway, with the total 2031 two-way average weekday volume on the Princes Highway forecast to be about 68 per cent less than in the 2031 'without project' scenario. This would be a significant reduction along a congested section of the strategic road network.

The traffic and transport assessment shows that mid-block operational performance levels along the existing M5 East Motorway would significantly improve with the forecast reductions in traffic on the motorway in 2021 and 2031, including improvements to average peak hour travel times in both directions during the AM and PM peaks under the 'with project' scenarios. This decongestion of the M5 East Motorway would improve speed, journey reliability and safety in this corridor.

The EIS acknowledges that other WestConnex projects including the M4–M5 Link are needed to deliver a number of project benefits. However, Section 1.4 of the EIS also identifies the project

benefits that would be delivered by the project alone and in combination with the King Georges Road Interchange Upgrade, which is currently under construction.

The New M5 project would:

- Provide additional motorway capacity along the main connection to Sydney Airport, Port Botany and south-west 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.

Together with the Southern Connector, the project would:

- Support the economic development of Sydney by providing a high quality and efficient road connection for motorists and freight vehicles between the Global Economic Corridor and Global Sydney (as defined in A Plan for Growing Sydney (NSW Government 2014)
- Provide additional capacity to address existing traffic congestion on the M5 East Motorway and local roads by separating longer distance through traffic from local traffic. Current traffic congestion is causing poor amenity along the M5 Motorway corridor and constraining the operation of existing businesses and efficient movement of freight
- Provide better connectivity between local centres adjacent along the M5 East corridor
- Facilitate urban renewal in precincts adjoining the M5 East Motorway corridor by improving local amenity with less traffic noise and vehicle emissions from congested traffic.

Network performance on local roads around St Peters interchange and Sydney Park

Network performance on local roads around the St Peters interchange is discussed in detail in **Section 5.8.19** of this report. Impacts on local streets from shortcuts (rat-running) are discussed in a following response in this section.

Forecast population growth in the local St Peters area would introduce more traffic to local roads. In 2021, traffic demand is likely to increase by eight per cent in the morning peak and 16 per cent in the afternoon peak. By 2031, traffic demand would be about 23 per cent higher than today in the morning peak and around 30 per cent higher in the afternoon peak.

Without WestConnex, this forecast growth in traffic would cause further congestion, with the network unable to accommodate the expected demand. By 2031, motorists travelling in the afternoon peak would experience significant congestion compared to today. This is forecast to result in a 67 per cent increase in travel times, a 40 per cent decrease in speeds and increasing delays at some intersections.

Without the project, traffic volumes on key local roads around St Peters are generally expected to increase due to projected population growth in the area. Intersection performance along local roads around St Peters interchange would also deteriorate as a result of the associated traffic growth.

Without the local road upgrades and the WestConnex project, this forecast growth in traffic would cause further congestion, with the network unable to accommodate the expected demand. By 2031, motorists travelling in the afternoon peak would experience significant congestion compared to today. This is forecast to result in a 67 per cent increase in travel times, a 40 per cent decrease in speeds and increasing delays at some intersections.

The St Peters interchange would be built on the Alexandria Landfill site at St Peters. The new interchange would connect the New M5 to St Peters and Mascot and would provide future connections to the M4–M5 Link and Sydney Gateway.

When the new interchange opens, motorists would be able to enter and exit the interchange and New M5 tunnels at the intersection of Campbell Road and Euston Road, St Peters and at Gardeners Road, Mascot via a new bridge over Alexandra Canal.

The interchange would also provide future connections to the proposed M4–M5 Link (Stage 3 of WestConnex) and Sydney Gateway, which would provide improved access and capacity to the port and airport.

Local streets and intersections around St Peters interchange would be upgraded to ensure safe and efficient connections for the New M5 and would provide the necessary additional capacity to cater for future traffic growth. The local road upgrades would include:

- A new, signalised intersection at the corner of Campbell Road and Euston Road, joining to St Peters interchange
- A new road bridge over Alexandra Canal, extending Campbell Road to connect with Bourke Road at Mascot
- Additional lanes on Euston Road between Campbell Road and Maddox Street
- Upgrading the intersection of Euston Road, Sydney Park Road and Huntley Street, including installing traffic signals
- Upgrading and widening Bourke Road / Bourke Street at Mascot between Church Street and the Campbell Road extension
- Additional lanes on the section of Gardeners Road connecting to St Peters interchange
- Additional lanes on Campbell Street and Campbell Road between the railway bridge near Camdenville Park and Bourke Road at Mascot
- New and upgraded pedestrian and cycle infrastructure.

The New M5 and the local road upgrades would cater for the expected population growth in Mascot and areas around St Peters, improve access to St Peters, Marrickville, Alexandria, Green Square and Mascot and provide new links between these suburbs. Substantial new capacity would be created along Campbell Street and Euston Road, directing through traffic along these routes and away from residential properties.

Average traffic speeds would increase, and journey times would decrease. In addition, traffic volumes would also decrease along Princes Highway including past residential properties, and two new road crossings over Alexandra Canal would address existing bottlenecks on the Ricketty Street Bridge.

Further detail on the potential benefits and impacts to the road network around the St Peters interchange and local roads is provided in **Section 5.8.19** of this report.

The traffic impact assessment carried out for the project has identified that additional road network augmentation beyond completion of the New M5 would be required by around 2031. At this time, traffic forecasting indicates unacceptably low levels of road network performance based on available network capacity (including completion of the New M5) and continued growth in traffic demand. The NSW Government has identified the WestConnex Stage 3 (M4–M5 Link) as the project to provide additional road network capacity and an application for approval of this project has been lodged with the Department of Planning and Environment. An EIS for the M4–M5 Link would be prepared and publicly exhibited for comment in the future. Should the M4–M5 Link not proceed, traffic forecasts indicate that additional upgrades would be required by around 2031 to avoid unacceptable deterioration in road network performance.

Environmental management measures in the EIS relating to congestion

An operational traffic review would be conducted 12 months following the commencement of operation to confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections. The operational traffic review would be undertaken by a suitably qualified traffic specialist that is independent of the design and traffic studies undertaken as part of the Environmental Impact Statement. The operational traffic review would include (but is not limited to) an assessment of the level of service at major intersections on local roads around the St Peters interchange, the King Georges Road interchange and changes in traffic levels on parallel arterial roads, such as Stoney Creek Road. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

Roads and Maritime would continue to monitor traffic conditions to identify any further road network and intersection upgrades that may be needed and this would include appropriate consultation with local councils and communities.

Further detail is provided in Section 9.4 of the EIS and Section 11.2 of the Technical working paper: Traffic and transport at Appendix G of the EIS which include environmental management measures designed to avoid, minimise or manage impacts on the road network, including increases in congestion as a result of forecast traffic volumes (refer to **Chapter 8** of this document for revised environmental management measures).

Issue description – congestion at on and off-ramps

The assessment has not considered potential delays at on-ramps and off-ramps at the project interchanges

Response

The travel time calculations include delays at intersection junctions including ramp terminals. The model's prediction of travel times is validated during the model development process to represent real-world observations of travel times on routes in the project corridor.

Issue description – improved level of service at some intersections

Submissions queried why under some 'without project' scenarios the level of service of some intersections would improve.

Response

As described in Section 4.1.1.6 of the Technical working paper: Traffic and transport (Appendix G of the EIS) the operation 'without project' or 'do minimum' scenario assumes that the King Georges Road Interchange Upgrade and the M4 Widening are complete, but the remainder of the WestConnex projects are not built. It is called the 'do minimum' or 'without project' scenario rather than 'do nothing' scenario as it assumes that ongoing improvements would be made to the broader transport network including some new infrastructure and intersection improvements to improve capacity and cater for traffic growth.

As traffic volumes and patterns change in a road network, and signal timings at intersections change in response to those changes, the level of service of some intersections improves, while the level of service at others deteriorates.

Issue description – impacts to travel times for bus services

Submissions raised concerns that the project would impact on travel times for bus services.

Response

The forecast reduction in traffic on the M5 East Motorway is unlikely to affect public transport services, as there are no regular bus services on the M5 East Motorway or the M5 South Western Motorway. Intercity coach services that use the M5 East Motorway or M5 South Western Motorway, such as those operated by Murrays or Greyhound, would benefit from reduced traffic and increased travel speeds on the M5 East Motorway as a result of the New M5 project and, later, the full WestConnex program of works and the Southern Connector (formerly the Southern extension).

Section 10.3.4.2 of the Technical working paper: Traffic and transport describes the forecast impacts on bus operations around the St Peters interchange. Specifically, Table 109 of Appendix G of the EIS details a comparison between bus travel times through the St Peters network under the 2021 'with project' vs 2021 'without project; scenario.

The assessment concluded that in 2021, many routes could benefit from decreased travel time due to improved traffic management and changed traffic demand compared with the 2021 'without project' scenario. Of the 22 services which cross the St Peters area, six PM peak services are forecast to experience a travel time improvement of 20 per cent or better for the sections of the route running through the modelled area, in comparison to the 2021 'without project' scenario. In the AM peak period, the time travel savings for buses in the modelled network would be less pronounced, with two services expected to see time travel improvements of greater than ten per cent when compared to the 2021 'without project' scenario.

There would also be some routes which would be likely to be see increased travel times. In the AM peak, three services are forecast to see travel time through the area increased by 20 per cent or more. Two services are forecast to be similarly affected during the PM peak period.

The modelled changes described above and shown in Table 109 of Appendix G of the EIS (Technical working paper: Traffic and transport) - which would range from a saving of 9.6 minutes to an increase of around 3.3 minutes - need to be interpreted in the context of the longer journey times and distances that buses travel between their origins and destinations, of which only a portion would fall within the area of the St Peters network which has been modelled for the project.

The project has been designed with sufficient flexibility so as to accommodate potential future bus priority measures that may be included in the future. Roads and Maritime and Transport for NSW would continue to work together to deliver Sydney's Bus Future in the area around St Peters, with the surface road network design ensuring that future adaptation to include bus priority measures already identified, as well as those yet to be identified, can be delivered.

Issue description – project would require other road upgrades

Submissions objected to the project on the basis that the projected traffic increases would result in congestion on the broader road network around the St Peters interchange, which would require future additional road upgrades.

Response

The upgrades to local roads around the St Peters interchange would deliver safe and efficient connections to the New M5, providing the necessary additional capacity in the road network to cater for the additional modelled traffic demand. These upgrades would be undertaken as part of the project and would have an immediate impact in managing forecast traffic demand around St Peters, at both the modelled year of opening (2021) and the modelled future year (2031).

The local road upgrades would include:

- A new, signalised intersection at the corner of Campbell Road and Euston Road, joining to the St Peters interchange
- A new road bridge over Alexandra Canal, extending Campbell Road to connect with Bourke Road at Mascot
- Additional lanes on Euston Road between Campbell Road and Maddox Street
- Upgrading the intersection of Euston Road, Sydney Park Road and Huntley Street, including installing traffic signals
- Upgrading and widening Bourke Road / Bourke Street at Mascot between Church Street and the Campbell Road extension
- Additional lanes on the section of Gardeners Road connecting to St Peters interchange
- Additional lanes on Campbell Street and Campbell Road between the railway bridge near Camdenville Park and Bourke Road at Mascot
- New and upgraded pedestrian and cycle infrastructure.

The New M5 and the local road upgrades would cater for the expected population growth in Mascot and areas around St Peters, improve access to St Peters, Marrickville, Alexandria, Green Square and Mascot and provide new links between these suburbs. Substantial new capacity would be created along Campbell Street and Euston Road, directing through traffic along these routes and away from residential properties and local streets.

The EIS acknowledges the importance of the M4–M5 Link in achieving all of the broader WestConnex strategic objectives. This is reflected in the traffic impact assessment carried out for the project, which identified that additional road network augmentation beyond completion of the New M5 would be required by around 2031.

At this time, traffic forecasting indicates unacceptably low levels of road network performance based on available network capacity (including completion of the New M5) and continued growth in traffic demand. The NSW Government has identified the WestConnex Stage 3 (M4–M5 Link) as the project to provide additional road network capacity and an application for approval of this project has been lodged with the Department of Planning and Environment. An EIS for the M4–M5 Link would be prepared and publicly exhibited for comment in the future. Should the M4–M5 Link not proceed, traffic forecasts indicate that additional upgrades would be required by around 2031 to avoid unacceptable deterioration in road network performance.

Section 9.3.2 and the Technical working paper: Traffic and transport (Appendix G of the EIS) provides the details of the assessment of operational impacts on the road network. Section 9.4 of the EIS and Section 11.2 of the Technical working paper: Traffic and transport at Appendix G of the EIS include environmental management measures designed to avoid, minimise or manage impacts on the road network, including impacts associated with congestion.

These include an operational traffic review, which would be undertaken about 12 months after the commencement of operation of the project. In undertaking the review, the level of service would be assessed at major intersections in the St Peters and Mascot area, as well as at the M5 East Motorway / King Georges Road interchange. The assessment would be based on actual traffic counts and the methodology used would be comparable with that used in this assessment. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

Issue description – WestConnex Stage 3

Submissions raised concerns that roads in the vicinity of the project would experience congestion if Stage 3 (M4–M5 Link) of the WestConnex full program of works was not completed.

Response

The traffic impact assessment carried out for the project has identified that additional road network augmentation beyond completion of the New M5 would be required by around 2031. At this time, traffic forecasting indicates unacceptably low levels of road network performance based on available network capacity (including completion of the New M5) and continued growth in traffic demand. The NSW Government has identified the WestConnex Stage 3 (M4–M5 Link) as the project to provide additional road network capacity and an application for approval of this project has been lodged with the Department of Planning and Environment. An EIS for the M4–M5 Link would be prepared and publicly exhibited for comment in the future. Should the M4–M5 Link not proceed, traffic forecasts indicate that additional upgrades would be required by around 2031 to avoid unacceptable deterioration in road network performance.

The EIS acknowledges that other WestConnex projects including the M4–M5 Link are needed to deliver a number of project benefits. However, Section 1.4 of the EIS also identifies the project benefits that would be delivered by the project alone and in combination with the King Georges Road Interchange Upgrade, which is currently under construction.

The New M5 project would:

- Provide additional motorway capacity along the main connection to Sydney Airport, Port Botany and south west 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.

Together with the Southern Connector, the project would:

- Support the economic development of Sydney by providing a high quality and efficient road connection for motorists and freight vehicles between the Global Economic Corridor and Global Sydney (as defined in *A Plan for Growing Sydney* (NSW Government 2014)
- Provide additional capacity to address existing traffic congestion on the M5 East and local roads by separating longer distance through traffic from local traffic. Current traffic congestion is causing poor amenity along the M5 corridor and constraining the operation of existing businesses and efficient movement of freight
- Provide better connectivity between local centres adjacent along the M5 East corridor
- Facilitate urban renewal in precincts adjoining the M5 East corridor by improving local amenity with less traffic noise and vehicle emissions from congested traffic.

Issue description – impacts on local streets from shortcuts

Submissions relating to operational traffic raised concerns that the EIS did not evaluate impacts of increased traffic on suburban streets as a result of people finding the best means and shortcuts to access the motorway and local centres, and from increased access to local roads around St Peters.

Response

Local streets and intersections around St Peters interchange would be upgraded to ensure safe and efficient connections for the New M5 and would provide the necessary additional capacity to cater for future traffic growth. The local road upgrades would include:

- A new, signalised intersection at the corner of Campbell Road and Euston Road, joining to St Peters interchange
- A new road bridge over Alexandra Canal, extending Campbell Road to connect with Bourke Road at Mascot
- Additional lanes on Euston Road between Campbell Road and Maddox Street
- Upgrading the intersection of Euston Road, Sydney Park Road and Huntley Street, including installing traffic signals
- Upgrading and widening Bourke Road / Bourke Street at Mascot between Church Street and the Campbell Road extension
- Additional lanes on the section of Gardeners Road connecting to St Peters interchange
- Additional lanes on Campbell Street and Campbell Road between the railway bridge near Camdenville Park and Bourke Road at Mascot
- New and upgraded pedestrian and cycle infrastructure.

The New M5 and the local road upgrades would cater for the expected population growth in Mascot and areas around St Peters, improve access to St Peters, Marrickville, Alexandria, Green Square and Mascot and provide new links between these suburbs. Substantial new capacity would be created along Campbell Street and Euston Road, directing through traffic along these routes and away from residential properties and local streets.

An operational traffic review would be conducted 12 months following the commencement of operation to confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections. The operational traffic review would be undertaken by a suitably qualified traffic specialist that is independent of the design and traffic studies undertaken as part of the Environmental Impact Statement. The operational traffic review would include (but is not limited to) an assessment of the level of service at major intersections on local roads around the St Peters interchange, the King Georges Road interchange and changes in traffic levels on parallel arterial roads, such as Stoney Creek Road. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

Issue description – impacts on King Georges Road from the project

Submissions objected to the claim that King Georges Road would see an improvement in travel times (of 49 per cent), where the EIS shows a LOS F, with or without WestConnex.

Response

When WestConnex is completed, the King Georges Road interchange Upgrade would reduce travel times at the intersection from as much as six and a half minutes, to three and a half minutes. This amounts to a 49 per cent travel time saving.

Issue description – access and connectivity to local centres

Submissions expressed concern that the project would not deliver on the objective of improved connectivity and access to local centres.

Response

Without the project, traffic volumes on key local roads around St Peters are generally expected to increase due to projected population growth in the area. Intersection performance along local roads around St Peters interchange would also deteriorate as a result of the associated traffic growth.

Without the local road upgrades and the WestConnex project, this forecast growth in traffic would cause further congestion, with the network unable to accommodate the expected demand. By 2031, motorists travelling in the afternoon peak would experience significant congestion compared to today. This is forecast to result in a 67 per cent increase in travel times, a 40 per cent decrease in speeds and increasing delays at some intersections. These delays would severely hamper motorists attempting to access local centres around St Peters and the broader area.

The St Peters interchange would connect the New M5 to St Peters and Mascot and would provide future connections to the M4–M5 Link and Sydney Gateway. When WestConnex is completed, motorists would be able to choose to stay on the New M5 for a direct connection to the M4 corridor or come up to the surface at St Peters.

On the surface, motorists would have four routes to choose from including:

- Continuing on to Euston Road, which would also take motorists to Alexandria
- Extending Campbell Road across Alexandra Canal providing a new local connection to Mascot town centre for motorists, pedestrians and cyclists
- A new direct connection to Mascot via Gardeners Road.
- Campbell Street / Road, for local access to St Peters. The St Peters interchange would also link with the proposed Sydney Gateway and the future connection to the M4–M5 Link.

The New M5 and the local road upgrades would cater for the expected population growth in Mascot and areas around St Peters, improve access to St Peters, Marrickville, Alexandria, Green Square and Mascot and provide new links between these suburbs. Substantial new capacity would be created along Campbell Street and Euston Road, directing through traffic along these routes and away from residential properties.

The extension of Campbell Road to create a new crossing of Alexandra Canal would also reduce the number of cars using Huntley Street or fighting to cross the canal at the Ricketty Street Bridge, fixing this traffic bottleneck for motorists and improving connectivity over the Alexandra Canal.

By moving through traffic from local roads into tunnels, congestion along the M5 East Motorway corridor and on local roads around the St Peters interchange would ease. For vehicles moving around the St Peters road network, the local road upgrades described above would provide the required new capacity to support the forecast growth in background traffic volumes and traffic resulting from the St Peters interchange.

Traffic modelling has also identified large reductions in vehicle travel time along the M5 East Motorway corridor between King Georges Road in the west and Foreshore Road in the east which would result from traffic switching to use the New M5, and some traffic choosing to use parallel arterial routes outside of the morning and afternoon peak. By decongesting the M5 East Motorway corridor, greater accessibility between Sydney's south-western suburbs, the Sydney CBD, Sydney Airport and Port Botany would result.

Improving local access and connectivity is also a function of the way in which the project achieves positive outcomes for bus operations and active transport options (including walking and cycling). Potential impacts (resulting in improvements and some minor reductions) to travel times for buses have been discussed in an earlier response within this section of this report.

The New M5 would significantly improve pedestrian and cyclist connectivity by providing around 14 kilometres of new and upgraded pedestrian and cycle infrastructure, linking the local centres of St Peters, Alexandria and Mascot and the broader area via connections to regional networks (e.g Bourke Street dedicated cycleway).

The active transport infrastructure to be implemented as part of the project would improve connectivity for cyclists and pedestrians via provision of a more integrated network. Further detail is provided in **Section 5.8.11** of this report.

Impacts to access and connectivity around the St Peters interchange have also been considered as part of the social and economic impact assessment prepared for the project and presented in Section 15.3.2 and Appendix M (Technical working paper: Social and economic) of the EIS. Concerns raised by the community in submissions regarding access and connectivity have been addressed in **Section 5.14** of this report.

Issue description – recommendations to reduce congestion

A submission recommended measures to aid in reducing congestion. Recommendations included:

- Instigate measures to encourage trucks to use the M5 East and New M5 in order to minimise diversion to the surface streets and to reduce the impacts on the surrounding road network and adjacent communities
- Ensure the New M5 is designed and operated to minimise both the number of times and duration it is closed for maintenance.

Response

These recommendations are noted.

A key design objective of the New M5 project is to ensure that where practicable it can be operated to minimise the durations that it is closed for maintenance. Notwithstanding this, motorway maintenance requiring full or partial motorway shutdown is often appropriate to ensure safety for both road user and maintenance worker and provide opportunity to maximise maintenance activities thereby ensuring both the frequency and duration of closures are minimised.

To confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections, an operational traffic review would be undertaken about 12 months after the commencement of operation of the project. The assessment would be based on, but would not be limited to, actual traffic counts and the methodology used would be comparable with that used in this assessment. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

Roads and Maritime would continue to monitor traffic conditions to identify any further road network and intersection upgrades that may be needed and this would include appropriate consultation with local councils and communities.

Issue description – congestion caused by pedestrian crossings

Submissions raised concerns that pedestrian crossings on Euston Road between Campbell Street and Sydney Park would result in traffic becoming congested on either side of the pedestrian crossings.

Response

Pedestrian crossings along Euston Road have been included to provide additional connectivity to Sydney Park.

The pedestrian crossings have been included in the operational traffic model for the project, including their potential implications for traffic flows. The pedestrian crossing signals would be coordinated with the surrounding intersections to minimise queuing along Euston Road.

To confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections, an operational traffic review would be undertaken about 12 months after the commencement of operation of the project.

Issue description – traffic lights would be required for turning trucks on Euston Road

Submissions raised concerns that the centre lane right turning bay on Euston Road between Campbell Street and Sydney Park Road would require traffic lights to allow trucks to turn into both eastern and western industrial properties. Submissions contended that this would result in traffic congestion.

Response

The centre lane right turning bay was included in the operational traffic model for the project. It is anticipated that vehicles would turn during gaps in the traffic flow created by pedestrian crossing facilities.

However in response to submissions concerning the design of Euston Road, Roads and Maritime would also investigate the ability to further reduce the width of Euston Road during detailed design through one or both of the following:

- Reductions in the lane widths
- Minimising the extent of, or need for the central turning lane along Euston Road.

This investigation would consider the changes to network performance, road safety for all users (including pedestrians) and implications for access to properties along Euston Road.

An environmental management measure has been included in **Chapter 8** (Revised environmental management measure) of this report to reflect this commitment.

Additionally, to confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections, an operational traffic review would be undertaken about 12 months after the commencement of operation of the project. The assessment would be based on actual traffic counts and the methodology used would be comparable with that used in this assessment. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

Roads and Maritime would continue to monitor traffic conditions to identify any further road network and intersection upgrades that may be needed and this would include appropriate consultation with local councils and communities.

Issue description – congestion due to lack of right hand turns into Sydney Park Road from Euston Road

Submissions raised concerns that there would be congestion if a right hand turn into Sydney Park Road from Euston Road was not permitted.

Response

The right hand turn from Euston Road into Sydney Park Road would be for buses only. It is expected that the turn would only be used a few times each hour due to the frequency of buses using the right hand turn at this intersection.

By allowing the right turn for all vehicles, the additional green time required to allow this movement would cause the other approaches to this intersection to queue excessively. This would result in the predicted level of service of this intersection falling below acceptable levels.

The length of the turn bay has been designed to allow this movement to be introduced at a future date if the capacity at the intersection allows.

To confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections, an operational traffic review would be undertaken about 12 months after the commencement of operation of the project. The assessment would be based on actual traffic counts and the methodology used would be comparable with that used in this assessment. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

Roads and Maritime would continue to monitor traffic conditions to identify any further road network and intersection upgrades that may be needed and this would include appropriate consultation with local councils and communities.

5.8.11 Impacts on pedestrians and cyclists during operation

213 submitters have raised issues regarding impacts on active transport users during operation.

Issue description – pedestrian and cyclist safety

Submissions stated that the St Peters interchange would encourage vehicles into local roads, posing a safety threat to pedestrians. Specific concerns included the impacts on pedestrian safety around schools, businesses, community centres, parks and residential areas. Submissions have also noted that there have been many incidents between cyclists and pedestrians in this area and the project would exacerbate this.

Increased volumes of traffic forced to use local roads at St Peters and surrounding suburbs would have an impact on the safety of other road users including cyclists and pedestrians

- Increased traffic around Sydney Park would impact the safety of pedestrians accessing the park
- The northbound left turn lane from Euston Road into Maddox Street would direct traffic through residential areas with narrow laneways
- The EIS fails to assess impacts to pedestrians and cyclists in streets parallel to Campbell Street and travelling over Bedwin Road Rail Bridge. Pedestrians with children walk across the bridge to access schools, childcare centres and the Marrickville Metro shopping centre
- Increased traffic along Campbell Street would impact the safety of the pedestrians who live in the Campbell Road terraces
- Traffic 'rat-running' on local streets would impact the safety of cyclists
- The project would reduce crossing access at intersections and impede the movement of pedestrians and cyclists, especially during peak traffic times
- The project would not deliver on the objective of improving road safety for road users, pedestrians and cyclists.

Response

When complete, the upgrades to local roads around the St Peters interchange would create substantial new capacity along Campbell Street and Euston Road and direct through traffic along these routes and away from residential properties along other suburban streets in the area. . In 2019 when the New M5 is complete but WestConnex Stage 3 (M4–M5 Link) is not, motorists would have three routes to choose from at St Peters interchange to get to their destination. This includes

Campbell Street / Road at St Peters, Euston Road at Alexandria and a new bridge over the canal to Bourke Road at Alexandria. With the completion of WestConnex Stage 3 (M4–M5 Link), additional through traffic would be diverted into the motorway network, further easing impacts on local road networks.

The diverting of through traffic from local roads onto these upgraded roads around the St Peters interchange, as well as onto the WestConnex tunnels, would be instrumental in improving pedestrian and cyclist safety.

Intersection upgrades as part of the local road upgrades would deliver safety improvements for pedestrians and cyclists. Signalised intersections provide a controlled environment under which pedestrians and cyclists can move between the existing and upgraded shared path network. The impact of pedestrian movements on signal phasing and intersection delays for vehicles has been assessed in the detailed operational modelling. In completing the modelling, pedestrians have been provided equivalent or better priority at signalised intersections throughout the study area.

Upgrading the intersection of Unwins Bridge Road / Campbell Street / Bedwin Road / May Street would deliver safe pedestrian and cyclist crossing of these roads, providing access to existing pedestrian and cyclist infrastructure along these roads outside of the project's area of impact.

This would improve safety for users of this intersection who access nearby schools, community facilities and the Marrickville Metro shopping centre. Improvements to the overall alignment of Bedwin Road associated with the realignment of this road between the railway bridge near Camdenville Park and the intersection with Unwins Bridge Road / May Street / Campbell Street would further support pedestrian and cyclist safety via the removal of two existing tight curves.

Further, in response to the exhibition of the EIS, and in response to submissions that raised concerns relating to pedestrian connectivity and safety, a number of changes have been made to the local road upgrades described in Chapter 5 of the EIS. Changes to the local upgrades affect:

- Euston Road / Sydney Park Road / Huntley Street intersection
- Albert Street and Campbell Road intersection
- Change to the shared path within Sydney Park
- New Campbell Road (extension) / Southend Distribution Centre intersection.

Changes to the local road upgrades in these locations are described further below and in **Section 7.2** of this report.

Euston Road / Sydney Park Road / Huntley Street intersection

As part of the project, the Euston Road / Sydney Park Road / Huntley Street intersection would be upgraded from a roundabout arrangement to a signalised intersection. The design, as proposed in the EIS, included a high angle left turn lane with a pedestrian island for eastbound traffic travelling on Sydney Park Road and wishing to travel northbound on Euston Road.

In response to submissions concerning pedestrian amenity and safety, the high angle left turn lane and pedestrian island have been removed. It would also improve pedestrian connectivity, crossing distances and crossing times as the movement would be completed in one phase when compared to two phase arrangement provided for originally in the EIS.

Further, the left turn lane for southbound traffic on Euston Road on approach to the Sydney Park Road / Huntley Street / Euston Road intersection has been shortened as this was not required for intersection performance and would rationalise road space at this location. This in turn would provide some pedestrian amenity improvements (when compared to the design as presented in the EIS) where additional distance to the road is provided.

The intersection as amended by the Preferred Infrastructure Report is shown in **Chapter 7** of this report.

Albert Street and Campbell Road intersection

The project, as described in the EIS, allows for the installation of temporary signals at this intersection to provide for construction access to the future M4–M5 Link construction site. Permanent signals would now be provided at this intersection.

This would maintain the at-grade pedestrian connectivity provided by the signalised intersection for pedestrians travelling to or from Sydney Park from nearby residential, commercial and industrial areas. It would also provide for enhanced connectivity to new public active transport links and open space in and around the St Peters interchange. The provision of permanent signals would also provide for:

- An alternative crossing at the Princes Highway / Campbell Street intersection
- An alternative for pedestrians to the Campbell Road pedestrian and cyclist bridge. This would assist in reducing the risk of jaywalking.

Minor amendments have also been made to the M4–M5 Link construction site access point.

The intersection as amended by the Preferred Infrastructure Report is shown in **Figure 7-5**.

New Campbell Road (extension) / Southend Distribution Centre intersection

The project, as described in the EIS (refer to Table 5-5), included the provision of a new T-intersection at the junction of the Campbell Road extension and the Southend Distribution Centre access road.

To increase crossing opportunities for pedestrians along Campbell Road, this intersection would now be signalised. Signalisation would also provide for safer crossing for pedestrians and cyclists using the dedicated east-west active transport route across the distribution centre access driveway. It would also continue to service the access and egress for the distribution centre.

The intersection as amended by the Preferred Infrastructure Report is shown in **Figure 7-6**.

Pedestrian and cyclist facilities

The project would also deliver around 14 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.

Throughout the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. Following exhibition of the EIS and in response to submissions, additional work has been undertaken to build on the work completed to date, and to ensure pedestrian and cyclist facilities are consistent with existing State and local government policies and strategies.

At present the pedestrian and cycling network in and around St Peters is fragmented, with a number of missing links, infrastructure of varying quality and a lack of safe, convenient crossings. A summary of the key locations and how the New M5 would improve existing conditions is provided in the response below and in **Section 5.5.2** of this report.

New active transport infrastructure in the St Peters, Mascot and Alexandria precincts would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure.

As compared to the ‘do nothing’ scenario, where forecast background traffic growth would need to be accommodated in the existing road network, provision of the WestConnex program of works and the local road upgrades would be expected to dissuade motorists from using shortcuts or ‘rat runs’ through other local streets. The project would not be expected to impact detrimentally on pedestrians and cyclists using local roads around the project via the encouragement of vehicles to use shortcuts or ‘rat runs’.

The layout changes to the road network around the St Peters interchange described in detail in Section 9.3.2 of the EIS are a fundamental component in the management of potential conflicts between pedestrians / cyclists and motor vehicles around the St Peters road network. These

upgrades would be undertaken as part of the project and would have an immediate impact in managing traffic safety.

The project has been designed with reference to relevant Austroads and Roads and Maritime design guidelines. The design, construction and commissioning would be subject to road safety audits prior to opening.

Issue description – impacts on pedestrian and cyclist connectivity

Submissions 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.

Response

The project would deliver around 14 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.

Throughout the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. Following exhibition of the EIS and in response to submissions, additional work has been undertaken to build on the work completed to date, and to ensure pedestrian and cyclist facilities are consistent with existing State and local government policies and strategies.

At present the pedestrian and cycling network in and around St Peters is fragmented, with a number of missing links, infrastructure of varying quality and a lack of safe, convenient crossings. A summary of the key locations and how the New M5 would improve existing conditions is provided.

Campbell Street

Campbell Street contains footpaths immediately adjacent to the northern and southern sides of the road, which are of varying quality. At present the width of these paths varies with some sections as little as 1.2 metres wide. There are no street trees or dedicated cycling facilities.

As part of the project, pedestrian footpaths would feature on both sides of the street, with consistent width and paving materials. A dedicated cycleway would be constructed on the northern side of the road and street trees would line the both sides of the street. At Simpson Park the street tree canopy would be selectively planted to ensure the existing figs within the park are featured. Both the pedestrian footpaths and cycleway would be separated from the road via a combination of street trees and landscape verges.

Euston Road

At present the pavement on the western side of Euston Road is fairly regular, however its width does not adequately accommodate a shared pedestrian and cyclepath. Street tree plantings on the western side are generally consistent and feature a mature canopy. The path on the eastern side of Euston Road is irregular in width and quality.

Project works along Euston Road would create a dedicated shared path on the western side of adequate width to accommodate both pedestrian and cycle movements. The shared path would be separated from the roadway through a landscaped verge. Through further investigation of lane widths, Roads and Maritime would determine whether elements of the existing street trees on the western side can be retained. The eastern side would include street tree plantings where possible, with the remainder of the street retaining the existing trees.

Pedestrian connectivity would be enhanced through the installation of dedicated crossings at signalised intersections, none of which exist at present.

Sydney Park Road

There is currently a pedestrian footpath on the southern side of Sydney Park Road that is of good quality. Semi mature trees currently line the street.

The project would continue the shared path of Euston Road on the southern side of Sydney Park Road up to the extent of local road upgrade works. This would complement the existing cycle route in this location and also better accommodate both pedestrian and cycle movements through increased path width. A crossing at the intersection of Sydney Park Road and Euston Road would provide a new connection for pedestrians and cyclists in this location.

Gardeners Road

The western extent of Gardeners Road currently contains footpaths of varying quality and width. Street trees line the majority of the street, however the species are varying.

Project works along Gardeners Road would upgrade the pedestrian footpaths with regular width and materials, improving the amenity and safety for pedestrians. Street trees would be included where possible, given building setback would become closer to the roadway.

Bourke Road

The section of Bourke Road between Gardeners Road and the project extension of Campbell Street features pedestrian paths of varying quality and width. The Bourke Street cycleway begins in this location, just north of the existing Thrifty car rental premises. Streets trees on the eastern side are mature, but irregular in pattern.

The most significant addition as a result of the project would be a connection between the northern and southern extents of the Bourke Street cycleway with a dedicated crossing over Gardeners Road. This would ensure that cyclists do not have to dismount and cross Gardeners Road. Pedestrian footpaths would be improved in terms of both quality and regular width, both north and south of Gardeners Road. Street tree planting would be included on both sides of the street and be regular in pattern and species selection.

New active transport infrastructure in the St Peters, Mascot and Alexandria precincts would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure. The active transport elements being provided as part of the project would also support and enable future pedestrian and cyclist connectivity opportunities. These would include:

- Providing opportunities for connection to a possible future extension of the Alexandria Canal cycleway by City of Sydney
- Design of the Alexandra Canal bridge such that it would not preclude a future connection to a path on the western side of the Alexandria Canal
- Design to allow for future connection to active transport infrastructure associated with WestConnex Stage 3 (M4–M5 Link)
- Allowing for potential future connection to the Princes Highway from Canal Road or into bike friendly roads in lanes running parallel with Princes Highway
- Allowing for a future gateway and connector to Alexandria Canal cycleway near Tempe Reserve and further west to Cooks River cycleway (the project is a component of the overall strategic link between the inner west and the Botany Precinct)
- Offering active transport opportunities to future residential developments in the area through Euston Road improvements and improvements around Barwon Park Road
- Enabling future improvements in the Marrickville area to further integrate the network
- Enabling possible future improvement to Barwon Park Road (by reducing road use to one lane and reducing traffic volume).

Pedestrian and cyclist connectivity is discussed further in **Section 5.5.2** of this report.

Issue description – pedestrian and cyclist movements not included in strategic model

Submissions have raised concerns that pedestrian and cyclist movements were not included in the strategic model and Traffic and Transport Assessment in the EIS. Specific concerns regarding the modelling of pedestrian and cyclist movements included:

- The EIS does not include any objective assessment of impacts on pedestrians and cyclists using the local and regional road network
- The travel time for walking and cycling has not been modelled
- There is insufficient detail given in the Traffic and Transport Assessment regarding cyclist accessibility and safety with regard to changes to cyclist and pedestrian routes
- There is insufficient detail given in the Traffic and Transport Assessment regarding cyclist safety given heavy vehicle usage on local streets.

Response

Non-motorised travel is forecast by the Transport for NSW Sydney Strategic Travel Model which provides the source for future growth in travel demands in Greater Metropolitan Area of Sydney.

Pedestrian and bicycle travel times have not been modelled. The impact of pedestrian movements on signal phasing and intersection delays for vehicles has been assessed in the detailed operational modelling.

In completing the modelling, pedestrians have been provided equivalent or better priority at signalised intersections throughout the study area.

Potential impacts to cyclist safety and accessibility, as well as improvements to the active transport network as a result of the project, are discussed in detail in earlier responses in this section of the report.

Issue description – relocation of bus stops

A submission has stated that the environmental management measure included in the EIS, 'Where bus stops are relocated, pedestrian access would be maintained including (if possible) disabled facilities' was insufficient. The submission stated that pedestrian access, including disabled access, should be maintained or improved compared to the existing level of access.

Response

Where bus stops are permanently relocated, disabled access would be maintained.

Some bus stops around the St Peters interchange and local road upgrades would be removed and / or relocated around St Peters and Mascot.

Local residents, business owners and bus passengers would be notified of traffic management procedures, and alternative bus stop locations and access would be provided. Where feasible and reasonable, this would include provision of facilities for people with a disability at temporary bus stops.

Ongoing consultation would be undertaken to provide information on any bus stops or access arrangements.

Issue description – modifications to M5 Motorway corridor east of King Georges Road

Submissions have raised concerns that cyclists would be unable to use the M5 Motorway corridor east of King Georges Road due to safety considerations. Submissions have identified that cyclists would be forced to ride in other areas where there are recreational cyclists including young children.

Response

The M5 East would be permanently closed to cyclists from the start of construction. Cyclists would be diverted onto the shared paths within Beverly Grove Park and / or surrounding local roads.

These paths and local roads are currently used by pedestrians and cyclists and the minor addition of cyclists diverted from using the M5 Motorway corridor would result in a negligible impact on commuter safety along this route.

Issue description – pedestrian and cyclist access at Kingsgrove

Submissions have questioned how pedestrians and cyclists would access Kingsgrove Road, Kingsgrove train station and shopping centre considering the realignment of the path within Beverly Grove Park. Submissions have noted that the design for the realigned path stops at the base of Garema Circuit but there is no indication about how pedestrians would access Kingsgrove Station from this point or how they would navigate tunnel spoil and noise mitigation sheds in the area.

Response

North – south pedestrian and cyclist connection around Kingsgrove Road at Kingsgrove is currently provided via the existing Karingal Street underpass beneath the M5 East Motorway. This connection would be maintained during construction and operation of the project.

Additional connection is also provided further west via the Kindilan underpass. Temporary closure of the Kindilan underpass would be required for around four weeks during construction to accommodate its extension and it would also be intermittently closed during construction. In instances where the underpass is closed, pedestrians and cyclists would be diverted to Karingal Street and Coolangatta Road for access between the southern and northern paths.

Pedestrians and cyclists using the Kindilan underpass would be physically separated from construction traffic to maintain safe access.

Issue description – retention of Linear Park pathway

Submissions have stated that the Linear Park pathway should be maintained because it is essential for pedestrians and cyclists.

Response

The shared path within Beverly Grove Park to the north of the M5 East Motorway would be permanently realigned so that it is to the north of the Kingsgrove North construction compound (C1).

The shared path within Beverly Grove Park to the south of the M5 East Motorway would be closed for the duration of construction due to space constraints. Pedestrians and cyclists would be diverted onto the northern path via Karingal Street and the Kindilan underpass. Pedestrian and cyclist access via the Kindilan underpass would generally be maintained during construction and would be physically separated from construction traffic to maintain safe access. The section of the path south of the M5 East Motorway impacted by the project would be reinstated following the completion of construction.

Issue description – request for specific pedestrian and cyclist safety measures

A submission requested that the following pedestrian and cyclist safety measures be incorporated into the project design:

- Extension of crash guardrail adjacent to the kerbside westbound lane at the Bexley North railway overpass further towards the intersection with Shaw Street
- Install crash protection for pedestrians on the footpath adjacent to the kerbside westbound lane of Bexley Road approaching Shaw Street.

Response

The requests made by the submission relates to a location outside of the project area. The New M5 alignment would be in-tunnel at Bexley Road, and so the provision of surface infrastructure has not been considered for the project design in this location.

5.8.12 Traffic safety during operation

175 submitters have raised issues regarding traffic safety during the construction period.

Issue description – hazardous materials

Submissions have opposed the use of surface roads (including local streets) being used to transport hazardous materials due to these materials not being able to be transported through the New M5 tunnels.

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 New M5 tunnels.

It is considered unlikely that the prohibition of these vehicles 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.

The transport of dangerous goods is regulated by the *Dangerous Goods (Road and Rail Transport) Act 2008* (NSW), *Dangerous Goods (Road and Rail Transport) Regulation 2014* (NSW) and the *Australian Code for the Transport of Dangerous Goods by Road and Rail* supported by relevant Australian Standards.

Issue description – traffic safety

Submissions 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.

Response

The traffic and transport assessment conducted for the project (summarised in Chapter 9 of the EIS) includes an assessment of road safety. This assessment was confined to the M5 East Motorway corridor and the road network around the St Peters interchange and local road upgrades where existing data can be used to estimate future behaviour.

The assessment demonstrated that for the M5 East Motorway corridor after construction of the project, there would be an overall road safety benefit on the corridor with a 14 per cent reduction in crash costs in 2021 from $17.88 million to $15.35 million annually.

This reduction in crash costs is slightly less pronounced in 2031 under the 'with project' scenario, with a reduction of around five per cent with costs falling from $19.50 million to about $18.55 million per annum. The reduction under the 'full WestConnex and the future Southern extension' scenario would be more pronounced. Costs would fall by around 11 per cent, from $19.50 million to $17.54 million per annum.

Daily traffic on the Princes Highway, Canal Road / Ricketty Street / Gardeners Road and Bourke Road is generally forecast to decrease in the 2021 under the 'with project' scenarios compared to the 'without project' scenarios. This, in combination with the planned intersection upgrades which would assist in better managing traffic movements at these intersections, would result in a decrease in the total number and cost of crashes.

About 85 per cent of crashes on Euston Road are at the Euston Road / Sydney Park Road intersection. This intersection would be signalised as part of the local road upgrades and would be an effective approach to reducing the number of incidents by an estimated 30 per cent. Nonetheless, an increase in the total number and cost of crashes is still expected on Euston Road due to an increase in forecast traffic.

In 2031 under the 'full WestConnex program of work' scenario, the forecast increase in traffic on Euston Road would result in an increase in the total number and cost of crashes on Euston Road, south of Sydney Park Road. However, the significant decrease in daily traffic forecast on the Princes Highway and Canal Road / Ricketty Street / Gardeners Road, in combination with the intersection upgrades as part of the local road upgrades to the local road network would result in a significant reduction in the total number and cost of crashes on these roads.

Section 9.3.2 of the EIS provides further detail regarding forecast crash statistics with and without the project.

Issue description – right hand turn onto Unwins Bridge Road

A submission has raised a concern that the right hand turn from Conway Place onto Unwins Bridge Road would be unsafe during the operation of the project due to increased traffic volumes. The submission has suggested that sight lines be considered for the turn.

Response

At the completion of the project there would be no change to existing vehicle access to Unwins Bridge Road from Conway Place.

The project has been designed to meet relevant Austroads and Roads and Maritime design guidelines. The design, construction and commissioning would be subject to road safety audits prior to opening.

To confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections, an operational traffic review would be undertaken about 12 months after the commencement of operation of the project. In undertaking the review, the level of service would be assessed at major intersections in the St Peters and Mascot area, as well as at the M5 East Motorway / King Georges Road interchange.

The assessment would be based on actual traffic counts and the methodology used would be comparable with that used in this assessment. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

Further detail is provided in Section 9.4 of the EIS and Section 11.2 of the Technical working paper: Traffic and transport at Appendix G of the EIS include environmental management measures designed to avoid, minimise or manage impacts on the road network, including increases in congestion as a result of forecast traffic volumes.

Issue description – congestion at tunnel portals and interchanges

A submission raised a concern that in-tunnel safety would be compromised if arterial traffic flows were blocked from the tunnel exits.

Response

Detailed assessments have been undertaken to ensure that queuing on the tunnel exit ramps at St Peters would not extend into or impact on the mainline tunnel.

To confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections, an operational traffic review would be undertaken about 12 months after the commencement of operation of the project. In undertaking the review, the level of service would be assessed at major intersections in the St Peters and Mascot area, as well as at the M5 East Motorway / King Georges Road interchange.

The assessment would be based on actual traffic counts and the methodology used would be comparable with that used in this assessment. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

Further detail is provided in Section 9.4 of the EIS and Section 11.2 of the Technical working paper: Traffic and transport at Appendix G of the EIS include environmental management measures designed to avoid, minimise or manage impacts on the road network, including increases in congestion as a result of forecast traffic volumes.

Issue description – safety of left turn from Euston Road into Maddox Street

A submission raised concern that the northbound left turn lane from Euston Road into Maddox Street is unsafe for the volume of traffic expected under the project.

Response

The northbound left turn from Euston Road into Maddox Street has been designed to accommodate the predicted volumes of traffic.

As stated in Section 5.7.7 of the EIS, new works would be designed generally in accordance with relevant Australian Standards, Austroads Design Standards, Guides and Codes, and the Roads and Maritime supplements to these documents. This would ensure that works are designed in a safe and operable manner.

To ensure safety, a road safety audit would be undertaken by a qualified auditor(s) as part of the detailed design and again immediately prior to project opening, to examine the design from a road safety perspective and identify potential safety issues. This process would be undertaken in accordance with the Accident Reduction Guide Part 2: Road Safety Audits (RTA, 2005).

To confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections, an operational traffic review would be undertaken about 12 months after the commencement of operation of the project. The assessment would be based on actual traffic counts and the methodology used would be comparable with that used in this assessment. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

Roads and Maritime would continue to monitor traffic conditions to identify any further road network and intersection upgrades that may be needed and this would include appropriate consultation with local councils and communities.

Issue description – safety of Euston Road widening

A submission raised concern that the widening of Euston Road would increase the risk of vehicles colliding with residential properties along the road.

Response

As described in Section 5.7.1 of the EIS, widening of Euston Road between the upgraded intersection of Campbell Road and Euston Road and the intersection of Euston Road and Maddox Street would be undertaken as part of the project to ensure safe and efficient connections to the New M5 and to cater for future growth.

As stated in Section 5.7.7 of the EIS, new works would be designed generally in accordance with relevant Australian Standards, Austroads Design Standards, Guides and Codes, and the Roads and Maritime supplements to these documents. This would ensure that works are designed in a safe and operable manner.

To ensure safety, a road safety audit would be undertaken by a qualified auditor(s) as part of the detailed design and again immediately prior to project opening, to examine the design from a road safety perspective and identify potential safety issues. This process would be undertaken in accordance with the Accident Reduction Guide Part 2: Road Safety Audits (RTA, 2005).

Issue description – breakdown lane design

A submission requested that breakdown lane shoulder widths on roads external to the tunnels are three metres wide to safely accommodate for broken down vehicles and their occupants and provide adequate access for emergency vehicles.

Response

The shoulder widths detailed in the EIS for the roads external to the project tunnels (the western surface works and the St Peters interchange) have been designed in accordance with the Austroads Guide to Road Design Part 3 – Road Geometry and Part 4C – Intersections. This design standard stipulates a range for shoulders on carriageways of between 1.5 metres to two metres, generally and 2.5 metres to three metres for high volume carriageways. It also specifies two metre shoulder widths for on and off-ramps.

The New M5 would be designed and delivered using 'smart motorway' technology. This includes an overall Incident Management System (IMS) which would manage all incidents along the New M5 including detection and incident response and coordination with the Transport Management Centre (TMC). The detection of incidents and breakdowns along the New M5 would be undertaken by the Traffic Incident Detection System (TIDs) or the Automatic Video Incident Detection System (AVIDS). The AVIDS and TIDS systems in combination with CCTV would provide full coverage along the New M5. These systems would detect and generate alarms in the Motorway Control Centre (MCC) for incident response from either the emergency services or motorway incident management teams.

If an incident is detected, the Integrated Speed and Lane Use Signs (ISLUS) would be deployed. This would then implement variable speed control zones and / or lane closures on the carriageway according to the nature and extent of the incident. The ISLUS signs would be located on the gantries at regular intervals along the full length of the motorway. In addition, Variable Message Signs (VMS) would be located along the motorway and on the local roads approaching the motorway. The VMS would be used to advise motorists of the associated traffic conditions.

Further to the design of the current shoulder widths to Austroads standards and the implementation of the 'smart motorway' technology for incident detection, response and control, additional widening of shoulder widths would not be required to adequately and safely respond to vehicle breakdowns and traffic incidents for the project.

The implications of widening the shoulders on the carriageways outside the tunnels would be an increase in the project boundary with subsequent impact on land required for the project and additional property acquisitions.

Issue description – request for the provision of raised markings

A submission requested that a continuous line of profiled line markings (raised markings) be installed as an edge line outside the tunnels in order to delineate traffic lanes from the road shoulder.

Response

The road surface external to the tunnels (the western surface works and the St Peters interchange) would incorporate low noise pavements, based on proximity to residential areas and in order to meet the overall road noise generation requirements for the project. Implementation of enhanced profile lane marking is not undertaken on low noise pavements due to the conflicting performance characteristics.

While provision of raised line marking could be considered during detailed design its implementation would be governed by proximity to residential areas. It is generally not provided within 500 metres of receivers.

To ensure safety, a road safety audit would be undertaken by a qualified auditor(s) as part of the detailed design and again immediately prior to project opening, to examine the design from a road safety perspective and identify potential safety issues. This process would be undertaken in accordance with the Accident Reduction Guide Part 2: Road Safety Audits (RTA, 2005).

Issue description – measures to stop prohibited vehicles

A submission requested that the project should incorporate high quality systems to stop over-height vehicles and vehicles carrying dangerous goods from entering the tunnel.

Response

The New M5 project would provide over height detectors at two locations for each tunnel portal approach to detect over height vehicles before entry to all of the tunnels. The over height detectors would be positioned before the final diversion to the tunnel and immediately after the final diversion. The over height detector system would include modulated light beams to detect all over height vehicles.

The first detector would provide a warning to the driver to divert while the second detector would alert tunnel operators of an over height vehicle that failed to divert prompting a tunnel closure to prevent impact. A tunnel closure is undertaken via operation of a physical barrier via the tunnel operator in the form of a boom or swing gate in combination with traffic aspect signals. Final positions of the over

height detection systems would be developed during the detailed design process in consultation with Roads and Maritime.

High visual impact warning signs dedicated to advising drivers of vehicles of their over height dimension detection would be erected at suitable locations on all approaches to tunnels to give the drivers adequate space to stop before entering the tunnels and opportunities to detour by alternative routes. The warning signs would advise drivers of over height vehicles not to enter the tunnels and to use a detour instead.

Vehicle over height detection on approach to tunnel portals would raise an alarm and alert in the Traffic Management and Control System (TMCS) for the tunnel operators, utilising the TMCS' incident detection and incident response functionality. Automatic incident responses to over height vehicle detection are generated within the TMCS and roadside devices are activated and produce effective advice to over height vehicle drivers. The over height detection system would initiate and place an appropriate message on the Variable Message Signs (VMS) on approaches and at the tunnel portal entrances.

Physical over height barriers would also be erected on the approaches to all tunnel portals to impact on the over height sections of over height vehicles and to prevent damage to the tunnel structures.

Issue description – right hand on and off ramps

A submission requested that options for the grade separation of traffic lanes be investigated, along with measures to remove right hand on and off ramps in order to improve traffic flow and safety between King Georges Road and Bexley Road.

Response

The project design between King Georges Road and Bexley Road has been designed to improve performance and ease conflicting movements along this section of the road.

Under the current configuration, eastbound traffic from the King Georges Road on-ramp needs to merge with the through lane traffic to get on to the M5 Motorway and would need to weave across one lane to get on the outside lane. Similarly, westbound traffic on the far side lane needs to weave across a through lane to get on to the off-ramp. Traffic on the near side lane is often obstructed by the single lane exit ramp to King Georges Road.

Under the proposed configuration, both the on-ramp and exit ramp would have two lanes. Eastbound traffic from the King Georges Road on-ramp does not need to merge to enter the motorway. Vehicles from the on-ramp that want to stay on M5 East can stay on the left lane and continue on the by-pass lane. Vehicles on the left lane that want to use the New M5 only need to have a lane change before the by-pass ramp. Traffic on the through lanes can go onto the new M5 or stay on M5 East by changing lanes well in advance. Westbound vehicles from the M5 East Motorway can get on the King George's Road exit ramp directly via the by-pass ramp before the New M5 tunnel portal. Vehicles from the New M5 can choose to stay on the motorway or use the King Georges Road off-ramp well before they exit the tunnel. The by-pass ramps effectively provide the same function as grade separation.

5.8.13 Incident response during operation

One submitter raised an issue regarding incident response (i.e incidents) during operation.

Issue description – publish of incident response details and requirements

A submission requested that the following details published with regard to incident response for the project:

- The operational requirements for the motorway in regards to identifying, responding to and clearing incidents such as vehicle crashes and breakdowns
- Monthly data regarding incidents on the motorway including the number of vehicle crashes and breakdowns, the duration of incidents and response times to rectifying incidents.

Response

The requests made by the submission are not the standard practice for the operation of motorways. A commitment to this effect cannot be made.

Issue description – maintenance of detour routes

A submission recommended that detour routes for the New M5 be maintained so that they have sufficient capacity to cater for high traffic in the event that the New M5 is closed due to a traffic incident. The submission specified that the lane widths on detour routes need to be sufficient to safely cater for large trucks.

Response

The submission is noted.

To confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections, an operational traffic review would be undertaken about 12 months after the commencement of operation of the project. The assessment would be based on actual traffic counts and the methodology used would be comparable with that used in this assessment. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

Roads and Maritime would continue to monitor traffic conditions to identify any further road network and intersection upgrades that may be needed and this would include appropriate consultation with local councils and communities.

5.8.14 Moving the bottleneck

87 submitters have raised concerns about removing an existing bottleneck to a new location.

Issue description – relocation of existing bottlenecks along Euston Road

Submissions have expressed concern that instead of mitigating traffic issues, the works to upgrade local roads in the vicinity of the St Peters interchange would only move the bottleneck elsewhere (e.g from the intersection of Euston Road and Sydney Park Road to the intersection of Euston Road and Maddox Street).

Response

Without the project, traffic volumes on key local roads around St Peters are generally expected to increase due to projected population growth in the area. Intersection performance along local roads around St Peters interchange would also deteriorate as a result of the associated traffic growth.

Without the local road upgrades and the WestConnex project, this forecast growth in traffic would cause further congestion, with the network unable to accommodate the expected demand. By 2031, motorists travelling in the afternoon peak would experience significant congestion compared to today. This is forecast to result in a 67 per cent increase in travel times, a 40 per cent decrease in speeds and increasing delays at some intersections.

St Peters interchange would be built on the Alexandria Landfill site at St Peters. The new interchange would connect the New M5 to St Peters and Mascot and would provide future connections to the M4–M5 Link and Sydney Gateway. When WestConnex is completed, motorists would be able to choose to stay on the New M5 for a direct connection to the M4 Motorway corridor or come up to the surface at St Peters.

On the surface, motorists would have four routes to choose from including:

- Continuing on to Euston Road, which would also take motorists to Alexandria
- Extending Campbell Road across Alexandra Canal providing a new local connection to Mascot town centre for motorists, pedestrians and cyclists
- A new direct connection to Mascot via Gardeners Road

- Campbell Street /Road, for local access to St Peters. The St Peters interchange would also link with the proposed Sydney Gateway and the future connection to the M4–M5 Link.

The extension of Campbell Road to create a new crossing of Alexandra Canal would also reduce the number of cars using Huntley Street or fighting to cross the canal at the Ricketty Street Bridge, fixing this traffic bottleneck for motorists.

By moving through traffic from local roads into tunnels, congestion along the M5 East Motorway corridor and on local roads around the St Peters interchange would ease. For vehicles moving around the St Peters road network, the local road upgrades described above would provide the required new capacity to support the forecast growth in background traffic volumes and traffic resulting from the St Peters interchange. This would assist in alleviating pressure on the local road network around St Peters and in turn avoiding the worsening of any existing or creation of any new bottlenecks, delivering faster average travel speeds and shorter average travel times compared to the 'without project' scenario.

While the project has been designed to not worsen existing trouble spots and bottlenecks, the New M5 is not intended to resolve existing performance issues with the broader network. To the extent that work may be required to address existing 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.

The EIS acknowledges that other WestConnex projects are needed to deliver a number of project benefits and to avoid potential congestion and bottleneck issues on local roads around the St Peters interchange. The traffic impact assessment carried out for the project has identified that additional road network augmentation beyond completion of the New M5 would be required by around 2031. At this time, traffic forecasting indicates unacceptably low levels of road network performance based on available network capacity (including completion of the New M5) and continued growth in traffic demand.

The NSW Government has identified the WestConnex Stage 3 (M4–M5 Link) as the project to provide additional road network capacity and an application for approval of this project has been lodged with the Department of Planning and Environment. An EIS for the M4–M5 Link would be prepared and publicly exhibited for comment in the future. Should the M4–M5 Link not proceed, traffic forecasts indicate that additional upgrades would be required by around 2031 to avoid unacceptable deterioration in road network performance.

Section 9.4 of the EIS and Section 11.2 of the Technical working paper: Traffic and transport at Appendix G of the EIS include 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.

To confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections, an operational traffic review would be undertaken about 12 months after the commencement of operation of the project. In undertaking the review, the level of service would be assessed at major intersections in the St Peters and Mascot area, as well as at the M5 East Motorway / King Georges Road interchange. The assessment would be based on actual traffic counts and the methodology used would be comparable with that used in this assessment. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

5.8.15 Tolling during operation

No issues raised in community submissions were categorised under 'tolling during operation'.

The issue of tolling during operation is discussed in **Section 5.3.3** of this report.

5.8.16 Parking during operation

1,523 submitters have raised issues regarding available parking during operation

Issue description – car parking along King Street at Newtown

Submissions have raised concerns that the project would result in the loss of car parking along King Street at Newtown. Specific concerns included that impacts to car parking along King Street would result in people seeking car parking in adjacent residential streets.

Response

The project would not remove the current on-street parking along King Street or modify the existing on-street parking arrangements.

To assess the potential impacts of traffic generated by the project on King Street, traffic modelling was undertaken to forecast predicted AM peak and PM peak roadway volumes under six scenarios as described in Section 9.1 of the EIS.

Submissions received relating to parking along King Street have raised concerns that additional traffic generated from the project would indirectly require on-street parking to be removed along King Street to increase road capacity and minimise the deterioration of traffic performance.

Table 5-6 presents the changes in peak hour traffic volumes on traffic routes adjacent to the traffic and transport study area in the vicinity of King Street in 2021 with the project, and in 2031 with the full WestConnex program of works and the future Southern Connector.

Table 5-6 Changes in peak hour traffic volumes on King Street (south of Alice Street) in 2021 with the project, and in 2031 with the full WestConnex program of works and the future Southern Connector

Location	Direction	2021 'without project' (vehicles per hour)	2021 'with project' (vehicle per hour)	Change in flow (per cent)	2031 'without project (vehicles per hour)'	2031 'full WestConnex program of works and the future Southern Connector' (vehicles per hour)	Change in flow (per cent)
AM peak							
King Street, south of Alice Street	Northbound	880	800	-10	1100	870	-21
	Southbound	560	620	11	450	730	62
PM peak							
King Street, south of Alice Street	Northbound	830	910	10%	890	940	6
	Southbound	1030	1010	-2%	980	1210	23

The most significant forecast change in flow along the section of King Street south of Alice Street would be under the 2031 'full WestConnex program of works and the future Southern Connector' scenario, where AM peak hour volumes southbound along King Street would increase by around 280 vehicles per hour or 62 per cent when compared to the 'without project' scenario. However, vehicles traveling southbound in the AM peak period would be traveling in the opposing direction to the dominant AM peak hour and would be within the design carrying capacity of the road and modifications to on-street car parking arrangements would not require modification.

Further, in 2031 under the 'full WestConnex and the future Southern Connector' scenario, vehicles traveling northbound along King Street (the dominant direction during the AM peak hour) would experience a reduction of around 21 per cent (230 vehicles per hour) when compared to the 2031 'without project' scenario.

Forecast traffic flows during the time periods when car parking is available, i.e. southbound in the morning peak and northbound in the afternoon, are lower than the existing 2014 traffic flows.

Issue description – general impacts on parking around St Peters

Concern was raised that the project would impact on parking for residents and businesses in the vicinity of the St Peters interchange. Specific concerns included:

- Details regarding permanent impacts on property and business access and on-street parking provision were not discussed adequately in the EIS and therefore subsequent impacts could not be evaluated
- The EIS does not provide a sufficient management response to the loss of on-street car parking
- The project would encourage additional numbers of 'park and ride' commuters to drive to the St Peters area and then commute by train from St Peters or Erskineville stations to the CBD, with attendant impacts on the availability of car parking in the local streets in the area
- The project would result in greater competition for limited parking spaces in St Peters and surrounding suburbs generally
- The permanent removal of some parking spaces
- Specific opposition to the removal of parking spaces on local streets around the St Peters interchange.

Response

Section 5.7.2 of the EIS describes the provision of parking as part of the road widening design. Along Campbell Street all traffic lanes would be around three metres wide. A parallel parking lane of around 2.5 metres would be provided in both directions along Campbell Street between Hutchinson Street and St Peters Street. Additional on-street and off street car parking spaces would be provided between St Peters Street and Church Street. Parking in the kerbside lanes of Euston Road would be permitted during off-peak periods.

The project would impact on some land currently used for residential and commercial parking around the St Peters interchange and local road upgrades. This would result in the permanent loss of on-street (and some off-street) parking. A summary of the indicative impact is provided in Table 9-52 of the EIS. **Table 5-7** summarises the changes to car parking resulting from the local road upgrades.

Table 5-7 Indicative permanent changes to car parking around the local road upgrades

Road section	Indicative impact
Campbell Street, between Princes Highway and Unwins Bridge Road	Addition of 34 on-street and 26 off-street spaces
Albert Street	Loss of 44 spaces along both sides
Campbell Road, between Barwon Park Road and Burrows Road	Loss of 111 spaces along both sides
Burrows Road, south-west of Campbell Road	Loss of 8 spaces along both sides
Burrows Road, north-east of Campbell Road	Loss of 15 spaces along both sides
Euston Road, north of Sydney Park Road intersection	Loss of 24 spaces along both sides
Huntley Street, east of Euston Road	Loss of 28 spaces along both sides
Princess Highway	Loss of 18 spaces along both sides
May Street	Loss of 38 spaces along both sides
Unwins Bridge Road	Loss of 33 spaces along both sides
Gardeners Road, between Kent Road and cul-de-sac of Gardeners Road	Loss of 47 on-street spaces
Bourke Road, north of Bourke Street / Gardeners Road intersection	Loss of 16 off-street spaces

The adjustments to property access required for the local road upgrades would consist of driveway adjustments / extensions along Euston Road, Campbell Street / Campbell Road and Gardeners Road. The details of expected property adjustments are provided in Table 13-9 of the EIS. These would be verified during detailed design and ongoing consultation with affected property owners would be undertaken.

The traffic impact assessment incorporates the effects of future demands for public transport. The traffic and transport assessment is based on traffic modelling using the WRTM, which relies on forecasts of car driver demand sourced from the Sydney Strategic Travel Model (STM) operated by the Transport for NSW Bureau of Statistics and Analytics. The STM uses projections of population and employment for the Sydney and forecasts mode choice between car, rail, bus, light rail and ferry modes for future infrastructure scenarios.

The modelling with STM for the New M5 EIS incorporated currently planned public transport schemes including Sydney Metro and CBD and South East Light Rail. The car driver demands forecast using STM after allowing for mode share due to these public transport projects under congested road conditions was subsequently used for forecasting WestConnex toll choice in WRTM.

An operational traffic review would be conducted 12 months following the commencement of operation to confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections. The operational traffic review would be undertaken by a suitably qualified traffic specialist that is independent of the design and traffic studies undertaken as part of the Environmental Impact Statement. The operational traffic review would include (but is not limited to) an assessment of the level of service at major intersections on local roads around the St Peters interchange, the King Georges Road interchange and changes in traffic levels on parallel arterial roads, such as Stoney Creek Road.The results and recommendations of the review would assist the development of the Roads and Maritime's network operations and infrastructure provision plans.

Issue description – opposition to clearways

Submissions have raised general concerns regarding the assurance that clearways would not be imposed for the project. Specific concerns included:

- Assurances that clearways would not be created cannot be trusted
- The creation of clearways is inevitable due to future increases to traffic in the project area
- Opposition to clearways in Newtown, Enmore, Alexandria and Erskineville
- Specific opposition to clearways on the following streets:

- King Street
- Edgeware Road
- May Street.

Response

There are no plans by the Sydney Motorway Corporation or Roads and Maritime to change the existing clearways on King Street or to change or implement clearways elsewhere on roads as part of the project.

Further, traffic currently using King Street as a through road would have an underground bypass once the M4–M5 Link is completed. Also, when upgraded, Campbell Street and Campbell and Euston roads would provide an alternative to Sydney Park Road, Princes Highway and King Street, which would reduce traffic on King Street.

Issue description – Household bin collection

A submission has queried how council bin collection would occur on Campbell Road if parking was to be removed along the street.

Response

The project would not have adverse impacts on the collection of kerbside bins along Campbell Road at St Peters.

Issue description – Impacts to parking for Campbell Road terraces

A submission raised concerns about access and parking facilities at the Campbell Road terraces. The submission raised the following specific concerns about the project design:

- There is limited access and no street-front parking facilities for residents of the Campbell Road terraces
- There is no right turn access into Harber Street or street-front parking planned for Harber Street residents.

The submission recommended that resident parking facilities or private parking being implemented in consideration of the concerns listed above.

Response

Harber Street north of Campbell Road would be retained and converted to provide for left-in and left-out turning arrangements.

The existing on-street parking on both sides of Campbell Road at this location (between Barwon Park Road and Burrows Road) would be removed. However, parking for residents along this section of Campbell Road is currently provided for via rear lane entry accessed from Harber Street. The existing car park on Harber Street is also available for parking at this location. The use of these would not change as a result of the project.

5.8.17 Induced demand

No issues raised in community submissions were categorised under ‘induced demand’.

The issue of induced demand is discussed in **Section 5.3.1** of this report.

5.8.18 Impacts on parallel routes

1,152 submitters have raised issues regarding impacts on parallel routes as a result of project operation.

Issue description – impacts on parallel routes

Submissions have expressed concern that drivers seeking to avoid the toll would use routes parallel to the project, exacerbating traffic congestion issues along these roads. Submissions raised the following specific issues and / or roads:

- Stoney Creek Road
- Moorefields Road
- Canterbury Road
- The project would increase congestion along the Princes Highway and Wickham Street at Arncliffe, and on residential streets around Arncliffe Public School

Response

Traffic modelling indicates that some motorists could choose to use alternate parallel routes, such as King Georges Road, Stoney Creek Road, Forest Road and Canterbury Road, instead of the M5 East Motorway corridor. This diversion of traffic onto arterial roads to avoid the toll is most likely to occur outside peak traffic periods, when there is generally spare capacity across the network. During peak periods these arterial roads are already at capacity and there is less incentive to divert from the motorway to avoid the toll.

Traffic using these parallel routes instead of the tolled motorway are not anticipated to have a significant impact from a traffic perspective (in terms of congestion) as there is generally spare capacity in the road network along these alternate routes outside of the morning and afternoon peak.

Section 9.3.2 of the EIS and the Technical working paper: Traffic and transport in Appendix G of the EIS provide further detail regarding the potential impacts of traffic switching to use alternate parallel routes along roads at the western and eastern ends of the project. The assessment identified the parallel routes which would have the potential to be impacted at each end of the project and presents a comparison of the two-way traffic volumes and traffic share in 2021 and 2031 with the project and the full WestConnex program of works and the future Southern Connector (formerly Southern extension).

The traffic impact assessment did not identify Moorefields Road at Kingsgrove, or, Wickham Road or local roads around the Arncliffe Public School at Arncliffe as being parallel routes which could be impacted by the project.

The project would deliver reduced traffic volumes along Princes Highway at the eastern end of the project. Compared to the 'without project' scenario, the share of traffic on the Princes Highway would decrease by around six per cent in 2021, and by almost 70 per cent in 2031 (under the full WestConnex program of works and the future Southern Connection (formerly Southern extension) scenario.

This would be primarily attributable to traffic diverting away from the Princes Highway and into free-flowing tunnels.

An operational traffic review would be undertaken to confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections about 12 months after the commencement of operation of the project. In undertaking the review, the level of service would be assessed at major intersections in the St Peters and Mascot area, as well as at the M5 East / King Georges Road interchange. Changes in traffic levels on parallel arterial roads, such as Stoney Creek Road, would also form part of the traffic review.

The assessment would be based on actual traffic counts and the methodology used would be comparable with that used in this assessment. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

Issue description – impacts to Unwins Bridge Road

One submission has queried why impacts to Unwins Bridge Road were not assessed in the wider assessment of impacts to parallel routes. The submission has identified that the route currently experiences high levels of congestion in peak traffic periods.

Response

Unwins Bridge Road and the Princes Highway run parallel to each other in a north east / south west direction. The New M5 would provide additional road capacity, reducing traffic flows on the Princes Highway and changing flows on Unwins Bridge Road.

Typically, the traffic impacts of new road infrastructure reduce with distance. The largest impact on Unwins Bridge Road would therefore be expected at its closest point to the New M5, at its junction with Campbell Street. In 2021 with the New M5 ('with project' scenario), the two way peak hour traffic flows on Unwins Bridge Road, at its junction with Campbell Street, would be changed when compared to the 'without project' or 'do minimum' scenario. This change would equate to around a 15 per cent reduction in two way peak hour traffic flows during the morning peak and around an 18 per cent increase during the afternoon peak).

In 2031 - with the M4–M5 link also operating (the 2031 'full WestConnex program of works and Southern Connector (formerly Southern extension) scenario) - the peak hour traffic flows on Unwins Bridge Road would be about 35 per cent lower during the morning peak and around 25 per cent lower in the afternoon peak, when compared to the 'without project' (or 'do minimum') scenario.

The traffic and transport assessment study area was identified based on the SEARs, and following consultation with Roads and Maritime based on forecast wider traffic impacts. The study area includes roadway and intersections that would be primarily impacted by the New M5 project.

The extent of the modelling covers the areas forecast to be impacted by the project. The objective of the operational traffic modelling is to determine the impact of New M5 traffic at the interchanges with the surface roads and therefore the associated roadworks required to achieve acceptable operational performance for the surrounding road network. This modelling takes into account ;background' traffic, which is expected to use the road network regardless of whether New M5 is constructed, plus the incremental additional traffic related specifically to New M5. The footprint of the operational model therefore needs to be sufficient to determine the configuration of any project-related roadworks. The footprint adopted for the St Peters interchange was specified by determining at what point on connecting roads the percentage of New M5 traffic was low (so that the majority of traffic on the road is 'background' traffic, rather than 'additional' traffic at that location). This means that any local road upgrades required to accommodate project-related traffic would be within the modelled area.

An operational traffic review would be undertaken to confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections about 12 months after the commencement of operation of the project. In undertaking the review, the level of service would be assessed at major intersections in the St Peters and Mascot area, as well as at the M5 East Motorway/ King Georges Road interchange. Changes in traffic levels on parallel arterial roads, such as Stoney Creek Road, would also form part of the traffic review. The Princes Highway at the eastern end of the project

The assessment would be based on actual traffic counts and the methodology used would be comparable with that used in this assessment. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

5.8.19 Impacts on local roads in St Peters

3,409 submitters have raised issues regarding impacts on local roads in St Peters as a result of project operation

Issue description – impacts on local roads around St Peters

Submissions have raised concerns about the impact of the project on local roads in the vicinity of the St Peters interchange. Issues included:

- Vehicles exiting the St Peters interchange portal in the AM peak, and entering WestConnex via the St Peters interchange in the PM peak, would use local roads in St Peters and surrounding suburbs
- Traffic exiting the tunnel at the St Peters interchange would have nowhere to go

- New link roads would need to be constructed to manage traffic exiting the tunnel at the St Peters interchange, which would compound the traffic congestion problems at this location
- Local roads in the vicinity of the St Peters interchange do not have sufficient capacity to absorb the additional traffic which would be generated by the project
- Intersections in St Peters and Alexandria would be the same or worse with the project in 2021 and in 2031
- Concern that Euston Road would not have sufficient capacity to handle 61,000 cars and that the project would lead to the congestion of Euston road and subsequent rat-running into local roads.

Specific concerns were raised regarding the impacts of increased traffic on the local roads presented in **Table 5-8**.

Table 5-8 Specific roads raised in concerns about impacts on local roads in St Peters

Road	Suburb
Euston Road	Alexandria
Lawrence Street	Alexandria
Campbell Road	St Peters
Huntley Street	Alexandria
Edgeware Road	Enmore
May Street	St Peters
Campbell Street	St Peters
Unwins Bridge Road	St Peters
King Street	Newtown
Enmore Road	Enmore
Maddox Street	Alexandria
Botany Road	Alexandria
Sydney Park Road	St Peters
Mitchell Road	Alexandria
McEvoy Street	Alexandria
Erskineville Road	Newtown
Bourke Road	Alexandria
Bedwin Road	St Peters
Lord Street	Newtown
Concord Street	Erskineville
Coulson Road	Erskineville
Princes Highway	

Response

Without the project, traffic volumes on key local roads around St Peters are generally expected to increase due to projected population growth in the area. Intersection performance along local roads around St Peters interchange would also deteriorate as a result of the associated traffic growth.

Without the local road upgrades and the WestConnex project, this forecast growth in traffic would cause further congestion, with the network unable to accommodate the expected demand. By 2031, motorists travelling in the afternoon peak would experience significant congestion compared to today. This is forecast to result in a 67 per cent increase in travel times, a 40 per cent decrease in speeds and increasing delays at some intersections.

St Peters interchange would be built on the Alexandria Landfill site at St Peters. The new interchange would connect the New M5 to St Peters and Mascot and would provide future connections to the M4–M5 Link and Sydney Gateway.

When the new interchange opens, motorists would be able to enter and exit the interchange and New M5 tunnels at the intersection of Campbell Road and Euston Road, St Peters and at Gardeners Road, Mascot via a new bridge over Alexandra Canal.

The interchange would also provide future connections to the proposed M4–M5 Link (Stage 3 of WestConnex) and Sydney Gateway, which would provide improved access and capacity to the port and airport.

Local streets and intersections around St Peters interchange would be upgraded to ensure safe and efficient connections for the New M5 and would provide the necessary additional capacity to cater for future traffic growth. The local road upgrades would include:

- A new, signalised intersection at the corner of Campbell Road and Euston Road, joining to St Peters interchange
- A new road bridge over Alexandra Canal, extending Campbell Road to connect with Bourke Road at Mascot
- Additional lanes on Euston Road between Campbell Road and Maddox Street
- Upgrading the intersection of Euston Road, Sydney Park Road and Huntley Street, including installing traffic signals
- Upgrading and widening Bourke Road / Bourke Street, Mascot between Church Street and the Campbell Road extension
- Additional lanes on the section of Gardeners Road connecting to St Peters interchange
- Additional lanes on Campbell Street and Campbell Road between the railway bridge near Camdenville Park and Bourke Road at Mascot
- New and upgraded pedestrian and cycle infrastructure.

The New M5 and the local road upgrades would cater for the expected population growth in Mascot and areas around St Peters, improve access to St Peters, Marrickville, Alexandria, Green Square and Mascot and provide new links between these suburbs. Substantial new capacity would be created along Campbell Street and Euston Road, directing through traffic along these routes and away from residential properties.

In addition, traffic volumes would also decrease along Princes Highway including past residential properties, and two new road crossings over Alexandra Canal would address existing bottlenecks on the Ricketty Street Bridge.

Average traffic speeds would increase, and journey times would decrease. The operational traffic impact assessment found that compared to the 'without project' scenarios, average time travelled per vehicle in the modelled network around the St Peters interchange would decrease, and average speed per vehicle would increase under both the 2021 'with project' scenario and the 2031 'full WestConnex and Southern extension' scenario. This modelling outcome means that the project would deliver reductions in both average delay and congestion in the modelled St Peters network for the AM and PM peak periods during both future years (2021 and 2031).

By 2021, the average travel time per vehicle through the modelled road network around the St Peters interchange reduces by about nine per cent in the AM peak hour, and by seven per cent in the PM peak hour, compared to the 'without project' scenario. The average speed per vehicle would increase by around 17 per cent and 16 per cent for the AM and PM peaks respectively.

By 2031, under the 'full WestConnex and future Southern extension' scenario, the average travel time per vehicle through the modelled road network would reduce by about 11 per cent and average speed would increase by around 42 per cent in the AM peak. In the PM peak hour, further significant improvements are forecast, with the average travel time per vehicle reducing by 26 per cent and average speed per vehicle increasing by 74 per cent.

The New M5 would also significantly improve pedestrian and cyclist connectivity by providing around 14 kilometres of new and upgraded pedestrian and cycle infrastructure.

Throughout the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. In response to submissions and as part of further design revisions since exhibition of the EIS, additional work has been undertaken to review the active

transport elements of the project to ensure pedestrian and cyclist connectivity and safety are incorporated, and are consistent with existing State and local government policies and strategies.

These significant improvements to pedestrian and cyclist connectivity around the St Peters interchange are discussed further in **Section 5.8.11** and **Section 5.5.2** of this report.

The traffic impact assessment carried out for the project has identified that additional road network augmentation beyond completion of the New M5 would be required by around 2031. At this time, traffic forecasting indicates unacceptably low levels of road network performance based on available network capacity (including completion of the New M5) and continued growth in traffic demand. The NSW Government has identified the WestConnex Stage 3 (M4–M5 Link) as the project to provide additional road network capacity and an application for approval of this project has been lodged with the Department of Planning and Environment. An EIS for the M4–M5 Link would be prepared and publicly exhibited for comment in the future. Should the M4–M5 Link not proceed, traffic forecasts indicate that additional upgrades would be required by around 2031 to avoid unacceptable deterioration in road network performance.

Section 9.4 and Appendix G of the EIS describe the environmental management measures (refer to **Chapter 8** of this document for revised environmental management measures) to be employed to manage operational traffic impacts on roads, including local roads, around the St Peters interchange.

These include a commitment to undertake an operational traffic review after 12 months of operation. The review would include an assessment of (LoS) at major intersections in the St Peters and Mascot areas. The results and recommendations of the review would assist the development of Roads and Maritime's network operations and infrastructure provision plans.

The New South Wales Government is committed to fixing 'pinch points' along key Sydney road corridors to improve road network performance. Funding has been committed for works along the Princes Highway as part of the 'Gateway to the South' Sydney to Illawarra Pinch Point program. Details of this work have yet to be finalised, but it is expected that any improvements to the operation of these intersections would likely lead to improved performance to local roads around the St Peters interchange.

In addition, two intersections have been included in the network performance modelling around the St Peters interchange and local road upgrades which would not be upgraded or modified as part of the project; the Sydney Park / Mitchell Road and the Princes Highway / May Street intersections. Additional measures may be required at these two intersections to allow traffic to move around the local road network as modelled. The options, described below, are an example of the types of measures which could be implemented to deter any undesirable movements through the wider road network should they occur:

- Prohibition of right-hand turn movements from Mitchell Road into Sydney Park Road. The local road upgrades would result in the prohibition of right-hand turn movements from Sydney Park Road southbound onto Euston Road. As a result, some additional through traffic could travel through the area to the west of Euston Road. By restricting the right-hand turn at the intersection of Mitchell Road and Sydney Park Road, this movement would be prohibited for general traffic and would limit these additional movements through the area. This could also be achieved by implementing other alternative measures outside of the modelling area
- Alterations to the layout of the Princes Highway / May Street intersection to only allow left-in and left-out turning movements at May Street to prevent traffic travelling southbound to turn right onto May Street from the Princes Highway. As part of the project, an alternative route to provide access to May Street has been provided by allowing vehicles to turn right at the Princes Highway / Campbell Street intersection, which is currently prohibited.

Roads and Maritime would monitor the traffic movements at these locations closely upon opening of the New M5 and, if required and subject to the successful outcome of further consultation with the local councils, stakeholders and community, plan to implement localised schemes, subject to separate assessment and approval.

Issue description – diversion of heavy vehicles from Ricketty Street

One submission has queried whether heavy and light vehicles that currently use Ricketty Street, Kent Road, Coward Street and O'Riordan Street would instead use Gardeners Road to connect to Botany Road at the completion of the Gardeners Road upgrade works.

Response

Gardeners Road currently provides an arterial standard road connection between Ricketty Street and Botany Road, and acts as an alternative to the local road connection via Kent Road and Coward Street. It is foreseeable that upgrade works to Gardeners Road as part of the local road upgrades may enhance the desirability of this connection between Ricketty Street and Botany Road. However, the extent to which this contributes to redistribution of traffic from the Kent Road and Coward Street alternative would depend largely on the nature of the traffic (local or regional trips) and the origin / destination of that traffic.

An operational traffic review would be undertaken to confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections about 12 months after the commencement of operation of the project. In undertaking the review, the level of service would be assessed at major intersections in the St Peters and Mascot area, as well as at the M5 East / King Georges Road interchange. Changes in traffic levels on parallel arterial roads, such as Stoney Creek Road, would also form part of the traffic review.

5.8.20 Cumulative Impacts

Nine submitters have raised concerns about cumulative traffic and transport impacts associated with the project.

Issue description – cumulative impacts around St Peters

Submissions raised concerns around cumulative traffic and congestion impacts associated with current and forthcoming urban development in suburbs in the vicinity of the St Peters interchange. Submissions raised specific concerns about the cumulative operational traffic impacts of development at the following locations:

- Ashmore Precinct
- Green Square
- Huntley Street, Alexandria
- Australian Technology Park
- Sydney Metro Waterloo train station
- Central to Eveleigh rail corridor.

Response

Assumptions relating to future urban development and future population growth in Sydney have been incorporated into the WestConnex Road Traffic Model (the strategic traffic model for the project) used for the project, including assumptions relating to developments at Green Square, Mascot, Wolli Creek and surrounding suburbs.

The WestConnex Road Traffic Model uses the Sydney Strategic Travel Model (STM) to derive base demand, including trip generation, trip distribution and mode choice modules, and incorporates demographic data related to land uses including population, employment and education enrolment projections. Projections were based on the Department of Planning and Environment's future population and employment forecasts (dated September 2014) data release from the Bureau of Transport Statistics, which has been derived from the 2011 Census data and incorporates known major urban renewal and developments, including those around Green Square, Mascot and Wolli Creek.

The forecast growth in background traffic volumes were then used as the basis for the modelling and assessment of traffic impacts of the project during construction and operation.

Further details regarding the incorporation of predicted background traffic growth as a result of urban and residential development are provided in the Section 9.1.3 and Section 9.1.4 of the EIS.

5.8.21 Integration with public transport

Two submitters have raised concerns about the integration of the project with existing public transport.

Issue description – impact on existing public transport

Submissions have raised general concerns that the project would impact on the operation of existing public transport.

Response

Impacts to travel times for bus services are discussed in detail in **Section 5.8.10** of this report.

The forecast reduction in traffic on the M5 East Motorway is unlikely to affect public transport services, as there are no regular bus services on the M5 East Motorway or the M5 South Western Motorway. Intercity coach services that use the M5 East Motorway or M5 South Western Motorway, such as those operated by Murrays or Greyhound, would benefit from reduced traffic and increased travel speeds on the M5 East Motorway as a result of the New M5 project and, later, the full WestConnex program of works and the Southern Connector (formerly the Southern extension).

Around the St Peters interchange and along the upgraded local roads, many routes could benefit from decreased travel time due to improved traffic management and changed traffic demand compared with the 2021 'without project' scenario. Of the 22 services which cross the St Peters area, six PM peak services are forecast to experience a travel time improvement of 20 per cent or better for the sections of the route running through the modelled area, in comparison to the 2021 'without project' scenario. In the AM peak period, the time travel savings for buses in the modelled network would be less pronounced, with two services expected to see time travel improvements of greater than ten per cent when compared to the 2021 'without project' scenario.

There would also be some routes which would be likely to be see increased travel times. In the AM peak, three services are forecast to see travel time through the area increased by 20 per cent or more. Two services are forecast to be similarly affected during the PM peak period.

Issue description – impact on future public transport

Submissions have raised general queries regarding how the project would integrate with future public transport projects, including light rail.

Response

The project has been designed with sufficient flexibility so as to accommodate potential future bus priority measures being included in the future. Roads and Maritime and Transport for NSW would continue to work together to deliver ongoing improvements to Sydney's bus network, including Sydney's Bus Future in the area around St Peters. The surface road network design would ensure that future adaptation to include bus priority measures already identified, as well as those yet to be identified, can be delivered.

5.9 Air Quality

5.9.1 General air quality during construction

13 submitters raised issues regarding general air quality during the construction period.

Issue description – general air quality impacts during construction

Submissions raised concerns about air pollution during the construction of the project, fearing dumping of materials on local streets and diminishing the air quality and serenity of the open space within the region.

Response

The main sources of air pollutants during construction are dust generated from earthworks and emissions from construction plant and equipment including heavy vehicles travelling to and from construction sites. A Construction Air Quality Management Plan would be prepared which would include management measures to reduce the generation of dust and emissions from plant and equipment during the construction phase. Further responses to these issues are found in **Section 5.9.3** and **Section 5.9.4** of this report.

The project does not include the placement of any spoil or other waste material in areas outside the construction footprint of the project or at facilities approved or licensed to accept those materials. No materials would be placed on local streets or in open space areas outside the project footprint.

There is the potential for construction vehicles tracking dirt onto public roads. Environmental management measures would be implemented to minimise the risk of this occurring during construction of the project. The following measures would be employed:

- Use of nominated spoil haulage routes, which minimise the use of local streets and have been designed to provide direct connectivity to the M5 East Motorway, wherever possible
- Construction compound layouts that allow 'on road' spoil trucks to remain on sealed internal roads and not on roads used by tunnelling trucks
- Rumble grids and truck washes at site exit points
- Use of covered spoil trucks for transporting spoil.

Measures to protect the amenity of open spaces during construction can be found in **Chapter 8** (Revised environmental management measures) of this report.

5.9.2 Dust generation during construction

2,167 submitters raised issues regarding the generation of dust during construction.

Issue description – generation of dust from construction

Submissions raised concern regarding the impacts of dust generated during construction, including dust pollution at St Peters. Questions were also raised within submissions regarding the contractors' methods of mitigating dust pollution during construction.

Response

Dust generation during construction would be mitigated and managed to ensure that acceptable ambient air quality outcomes are achieved, and to avoid significant amenity impacts for surrounding receivers. These measures would be applied across all project construction sites, including at construction sites in St Peters.

Management measures to prevent the generation and emission of dust and air pollutants during construction are described in Section 10.10 of the EIS. These include undertaking regular site inspections to monitor dust and recording inspection results. A Construction Air Quality Management Plan would be prepared for the project as part of the Construction Environmental Management Plan (CEMP) which would describe how these management measures would 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. Community consultation, including management of complaints, would continue during construction.

5.9.3 Emissions from construction plant and equipment

139 submitters raised issues regarding emissions from construction plant and equipment.

Issue description – impacts on air quality from construction vehicles

Submissions noted the impacts on air quality in the Bexley, Kingsgrove and St Peters local areas, and in the inner west of Sydney due to the increase in heavy vehicles as a result of construction activities. Submissions expressed concern about the potential impacts of diesel exhaust generated by construction equipment and associated vehicles on children and elderly in surrounding neighbourhoods.

Response

The air quality impact assessment was undertaken in accordance with the relevant requirements of the Secretary's Environmental Assessment Requirements (SEARs) issued for the project. Appendix H (Technical working paper: Air quality) of the EIS presents the assessment of the impacts from construction of the project in the Bexley, Kingsgrove and St Peters local areas. It also considers broader regional impacts, including those in the inner west of Sydney. Potential impacts on local air quality during construction, including potential impacts from construction vehicle and equipment exhaust, was assessed using a risk-based approach, which determined that standard management 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 dust and air pollutants during construction are described in Section 10.10 of the EIS. A Construction Air Quality Management Plan would be prepared for the project as part of the Construction Environmental Management Plan (CEMP) which would include management measures, and procedures to guide their implementation during construction to minimise diesel emissions. These measures would include:

- All construction plant and equipment must be maintained and operated to minimise emissions. Visible smoke should not be emitted for any period greater than 15 seconds for plant not registered for use on public roads and 10 seconds for plant registered for use on public roads
- Ensure all on-road vehicles comply with relevant emissions standards
- Use of nominated spoil haulage routes, which minimise the use of local streets and have been designed to provide direct connectivity to the M5 East Motorway, wherever possible
- Ensure that, where practicable, engine idling is minimised when stationary
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.

5.9.4 Odour impacts during construction

No issues raised in community submissions were categorised under 'odour impacts during construction'.

5.9.5 Cumulative construction impacts

66 submitters raised issues regarding cumulative construction impacts to air quality.

Issue description – cumulative construction impacts

Submissions have expressed concerns regarding cumulative construction impacts, including dust from the M4 East.

Response

The M4 East project would be subject to similar dust management measures as the New M5 project and the distance of around eight kilometres between the two projects would ensure that dispersion of any dust generated by the M4 East would not generate a significant risk of cumulative construction dust impacts between the two projects.

5.9.6 Level and quality of assessment during construction and operation

2,346 submitters raised issues regarding assessment and modelling of air quality impacts during the construction period and the operation of the project.

Issue description – concern regarding methodology for assessing air quality during construction

Submissions have expressed concern about how the air quality impact assessment addresses the impacts of emissions from construction vehicles during construction. Specific concerns included:

- The air quality impacts resulting from increased heavy vehicles in the Kingsgrove and Bexley areas
- General impacts of the pollution from diesel-powered trucks during construction and requires further assessment.

Response

The air quality impact assessment was undertaken in accordance with the relevant requirements of the SEARs issued for the project. Appendix H (Technical working paper: Air quality) of the EIS presents the assessment of the impacts from construction of the project in the Bexley and Kingsgrove local areas. Potential impacts on local air quality during construction were assessed using a risk-based approach, which determined that standard management 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 are described in Section 10.10 of the EIS. A Construction Air Quality Management Plan would be prepared for the project as part of the CEMP which would include management measures, and procedures to guide their implementation during construction to minimise diesel emissions. These measures would include:

- All construction plant and equipment must be maintained and operated to minimise emissions. Visible smoke should not be emitted for any period greater than 15 seconds for plant not registered for use on public roads and 10 seconds for plant registered for use on public roads.
- Ensure all on-road vehicles comply with relevant emissions standards
- Use of nominated spoil haulage routes, which minimise the use of local streets and have been designed to provide direct connectivity to the M5 East Motorway, wherever possible
- Ensure that, where practicable, engine idling is minimised when stationary
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.

Issue description – concern regarding the methodology for assessing air quality during operation of the project

Submissions expressed concern about the quality of the air quality impact assessment during operation of the project. Specific concerns included:

- The air quality impact assessment incorrectly draws similarities between the areas that NorthConnex traverses and those areas which WestConnex traverses
- The air quality impact assessment does not adequately consider alternatives apart from a ‘do nothing’ scenario
- The air quality impact assessment does not specifically identify Clempton Park, Beverly Hills Park, Cahill Park, Bennet Park and Beaumont Park
- Lack of roadside monitoring of the air quality impact assessment
- The air quality information is presented within the report is complex and difficult to understand

- The ventilation is 50 per cent underestimated within the tunnels between King Georges Road, Bexley Road and Arncliffe and potentially 80 per cent underestimated within the tunnels between Arncliffe and St Peters because the tunnels are being built to accommodate three and five lanes respectively, but only marked for two lanes
- Lack of modelling of different ventilation outlet height scenarios
- Disagree with the air quality limits used throughout assessment
- Assessment appears to ignore key actions recommended within the new National Clean Air Agreement (including initiatives to reduce localised emissions)
- Use of the traffic modelling as a basis for the air quality modelling as traffic modelling is thought to be inaccurate
- Lack of assessment for quantified emissions or ground level concentrations of all air pollutants associated with motor vehicles (eg metals, sulphur dioxide, organics) and concern that ground level concentrations have been underestimated, as air pollutant emission rates applied in the dispersion model appear to be averaged through each day
- GRAL (Graz Lagangrian) model used to predict $PM_{2.5}$ concentrations associated with surface roads and tunnel ventilation outlet does not include emissions from off-road / non-traffic sources connected to project (construction equipment)
- Lack of confidence in data without confirmation that the Alexandria Landfill clean-up work, which started about the same time as New M5 project-specific monitoring, did not skew the data recorded for the stations
- Questioned whether the broader whole of project contours for the various air pollutants include contributions from the ventilation outlet
- Use of dispersion modelling not providing accurate location-specific measurements or predictions. Section 9.4.1 of the EIS acknowledges that it is problematic to predict pollutant dispersion under low wind speed conditions or for low level non buoyant sources and that outputs from the modelling are not representative of actual concentrations at any given location
- Air quality modelling indicates that there would be an increase in the levels of this particle pollution beyond the World Health Organisation (WHO) guidelines
- Conversion factors within the EIS are incorrect for tunnel ventilation outlet emissions – particulate matter concentrations would then be underestimated by a factor of two
- PIARC (World Road Authority) guidelines are not adequate to ensure safe visibility from particle matter in tunnels and questions regarding the suitability of the PIARC guidelines and their reliability to produce optimal outcomes.
- Methods used to produce the whole of the air quality assessment lack any reliable way of estimating the actual gravimetric concentration of particle components
- Concern that any assessment method which simply adds these components on a basis of weight is scientifically invalid. Submission asked for an accurate and robust way of predicting and estimating particulate matter and, especially, the quantity and nature of the various size classes
- Concern that the use of this ventilation technique is untested on this scale
- Concern that although carbon monoxide in vehicle exhaust has decreased over time, other harmful exhaust components have increased as a proportion of the reduced volume of vitiated air inside tunnels.

Response

References to NorthConnex

The New M5 air quality impact assessment, Appendix H (Technical working paper: Air quality) makes reference to the NorthConnex project for two reasons:

- First, to respond to the SEARs for the New M5 which require the air quality impact assessment to consider the approved air quality criteria for the NorthConnex project. This is because new in-tunnel air quality criteria were applied to the NorthConnex project in the approval conditions for that project. The detailed design of the New M5 tunnel would ensure that the project's ventilation system is appropriately designed to achieve these criteria (refer to Table 10-6 in Chapter 10 of the EIS) under all operating conditions
- Second, to make use of data collected during preparation of the air quality impact assessment for the NorthConnex project in order to include in the GRAL model as background data for urban areas in the Sydney basin.

Consideration of alternatives to the project

The assessment of alternatives to the project is presented in Chapter 4 of the EIS. As none of the strategic alternatives were considered to meet the project objectives, no further assessment was required, including for air quality.

Impacts to local parks

Beverly Hills Park was identified as the site of an urban air quality monitoring station in Table 10-19 of the EIS. Other parks were not specifically mentioned. This is because the assessment of air quality impacts used locations that were representative of the local area for both monitoring station locations and sensitive receiver locations. These locations were subject to the detailed air quality impact assessment. The air quality in these parks would be very similar to the assessed air quality at the nearest sensitive receiver location identified in Technical working paper: Air quality (Appendix H of the EIS).

Roadside monitoring

The assessment of background pollutant concentrations was based on data collected at Office of Environment and Heritage (OEH) background monitoring sites and Roads and Maritime roadside sites. Data from Roads and Maritime roadside monitoring sites was used to evaluate dispersion model performance.

Seven new monitoring sites were established in the New M5 area including three monitoring stations at urban background and four monitoring stations to characterise roadside air quality. The monitors were established in July / August 2015.

The monitoring data from the established monitoring stations (installed in 2015) for the M4 East and New M5 projects were deliberately excluded from the development of background concentrations. The reason for this was that the base year for the assessment was 2014. Therefore, both background concentrations and meteorological data for 2014 were used in the analysis; it is important in such an analysis that the background concentrations and meteorology are contemporaneous.

An analysis of the data from the New M5 monitoring stations, including roadside monitoring stations was undertaken during the preparation of this Submissions and Preferred Infrastructure Report and is presented in **Section 4.3.13**.

Complexity of air quality information

The air quality information provided is intended to meet the required regulatory and statutory requirements for assessment and support a review by regulators and experts. Due to the range of factors and pollutants addressed, a large amount of information is presented to preserve the integrity of the data. A simplified version is provided in the executive summary, and community information sessions were provided to supplement the EIS with additional information and opportunity to discuss the assessments further. An air quality fact sheet is also available on the WestConnex website to explain how air quality is assessed.

Additional lanes

The EIS seeks approval to construct tunnels as follows:

- Between the western portals and Arncliffe the tunnels would be built to be three lanes wide, but marked for two lanes

- Between Arncliffe and St Peters the tunnels would be built to be five lanes wide but marked for two lanes.

The EIS seeks approval to operate the project tunnels with only two marked lanes of traffic and demonstrates the ventilation system has sufficient capacity to readily achieve the ventilation design criteria.

Furthermore, the EIS makes it clear (Section 5.1) that any change from a two lane tunnel would be subject to future environmental assessment and approval.

The project has been designed to offer flexibility for the future and should a decision be made in the future to seek approval to increase the number of trafficable lanes in the tunnel to greater than two, the capacity of the ventilation system would be reviewed at that time and any changes required would be proposed as part of a separate environmental assessment process.

Modelling of ventilation outlet height scenarios

The sensitivity of the air quality model predictions to the height of the ventilation outlets was considered in Section 9.9.2 of the Technical working paper: Air quality (Appendix H of the EIS). The contribution of the ventilation outlets to the total concentrations is small (as shown in Table 9-36 of the Technical working paper: Air quality (Appendix H of the EIS)).

Air quality limits used during assessment

The air quality impact assessment was undertaken using methodology in accordance with the relevant requirements of the SEARs for the project and is consistent with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005).

Alignment of National Clean Air Agreement

The project has been designed to reduce surface road congestion, and hence vehicle emissions, noting that vehicles generate lower emissions under free flowing conditions compared with congested stop-start travel. The changes in overall emissions from surface roads due to the project, taking into account both positive and negative changes in air quality, would be relatively small. There are predicted to be either small decreases or small increases (depending on the pollutant / scenario) in overall emissions, allowing for traffic growth.

Use of traffic modelling as basis for air quality modelling

The modelling undertaken to assess air quality considered not only the current fleet, but included assumptions about the likely growth and change in the fleet, including fuel mix, over the next 20 years. The primary source for these assumptions is the NSW EPA Air Emissions Inventory which models emissions for the Greater Metropolitan Region. The assumed growth in diesel share in the fleet was recently reviewed by the EPA and determined to be conservative – actual growth in diesel vehicles is overestimated – and therefore the assumed emissions are also conservative.

Quantified emissions or ground level concentrations pollution assessment

The key pollutants from vehicles have been addressed in the air quality assessment report (Appendix H of the EIS) consistent with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005).

Ground level concentrations have been calculated using hourly varying emission rates for ventilation outlets. Surface roads emissions were calculated separately for four periods of the day: AM peak, inter-peak, PM peak and evening to ensure accuracy in the data collected.

GRAL model and emissions from off-road/non-traffic sources connected to project

The air quality impact assessment (Appendix H of the EIS) for the project was prepared in accordance with the SEARs issued for the project. The SEARs do not specify a requirement for a quantitative assessment of air quality for construction. The reasons for not undertaking a quantitative assessment are detailed in Section 5.5.1 of the Technical working paper: Air quality (Appendix H of the EIS). A quantitative assessment would not provide any additional benefits given the comprehensive mitigation measures already recommended.

Alexandria Landfill clean-up work and impact on monitoring

The assessment of background pollutant concentrations was based on data collected at OEH background monitoring sites and Roads and Maritime roadside sites. Data from Roads and Maritime roadside monitoring sites was used to evaluate dispersion model performance, rather than being a direct input into background air quality data in the model.

Seven new monitoring sites were established in the New M5 area including three monitoring stations at urban background and four monitoring stations to characterise roadside air quality. The monitors were established in July / August 2015.

The monitoring data from the established monitoring stations (installed in 2015) for the M4 East and New M5 projects were deliberately excluded from the development of background air quality data. The reason for this was that the base year for the assessment was 2014. Therefore, both background concentrations and meteorological data for 2014 were used in the analysis; it is important in such an analysis that the background concentrations and meteorology are contemporaneous.

Because the data from the New M5 project air quality monitoring stations was not used as part of the background air quality data for the air quality impact assessment presented in the EIS, any effects that ongoing activities at the Alexandria Landfill may have had on New M5 project air quality monitoring data would not have affected the outcomes of the air quality impact assessment.

An analysis of the data from the New M5 monitoring stations, including roadside monitoring stations was undertaken during the preparation of this Submissions and Preferred Infrastructure Report and is presented in **Section 4.3.13**.

Project contours and contributions from the ventilation facility

All pollution contour plots for the whole New M5 GRAL domain include the contributions from the background, from surface roads and from tunnel ventilation outlets.

Use of dispersion modelling

A sophisticated meteorological and Lagrangian dispersion model utilising a full year of meteorological data was used in the assessment. This provided inputs such as wind direction, strength, calms, and inversions, to determine the peak concentration of pollutants that may occur. Details of existing meteorology are in Section 6.4 of the Technical working paper: Air quality (Appendix H of the EIS) and Appendix H of the Technical working paper reviews the sensitivity of the model to these inputs, and hence the significance of the meteorology in determining impacts.

Contour plots are provided in the Technical working paper: Air quality (Appendix H of the EIS) indicating dispersal of pollutants from the western and eastern ventilation outlets.

World Health Organisation guidelines for particle pollution

The WHO guidelines for annual mean $PM_{2.5}$ is 10 µg/m^3. This is predicted to be exceeded at around two per cent of receivers. However, the project results in a reduction in the proportion of receivers with a concentration above 10 µg/m^3 in both 2021 and 2031. The WHO guideline for 24-hour mean $PM_{2.5}$ is 25 µg/m^3. Again, the project would result in a reduction in the proportion of receivers with a maximum concentration above 25 µg/m^3 in both 2021 and 2031.

Particulate matter concentrations in ventilation outlets and use of PIARC emission factors

Calculation of in-tunnel air quality and the design of the project's ventilation system has applied emission factors published by the Permanent International Association of Road Congresses (PIARC) (2012), and specifically those published for Australia.

The PIARC emission factors have been used to calculate emissions of particulate matter, NO_X and CO from vehicles within the tunnel for the purpose of design the tunnel ventilation systems to ensure that acceptable in-tunnel air quality can be maintained under normal operating conditions. Particulate matter concentrations have been calculated using the extinction coefficient relationship published by PIARC (i.e. particulate matter concentrations are inversely proportional to light extinction).

PIARC (2012) provides Australian-specific emissions based on fleet distribution data and emission standards relevant to Australia. The authors of the PIARC emission factors state that the factors were developed for the purpose of defining the minimum air flows required to achieve adequate air quality within road tunnels – as such, a safety margin is added to the emission factors such that, if these emission factors are used for developing emission inventories for dispersion modelling purposes, the estimated emissions are likely to be higher than would be expected in practice. The use of conservative emission factors results in higher predicted pollutant concentrations for in-tunnel and ambient receivers than would be predicted using less conservative emissions estimates.

A recent study (PEL, September 2014) comparing the PIARC emission rates to pollutant concentrations measured in the ventilation outlets of the Lane Cove Tunnel by Pacific Environment Limited (2014) determined that the PIARC emission factors overestimated emissions of 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 than the New M5 project, the results of the Pacific Environment Limited study provide an indication of the potential scale of the overestimation of emissions when using the PIARC emission factors (compared to the NSW vehicle fleet using the Lane Cove Tunnel). Given these data, it could be expected that the actual pollutant concentrations within the project tunnels could be 1.6 to 1.8 times lower for NO_x and 2.8 to 4.4 times lower for $PM_{2.5}$ than the in-tunnel emissions concentrations that have been conservative assumed to ensure sufficient safety margin in the design of the tunnel ventilation systems.

Assessment of gravimetric concentration of particle components

The estimation of actual gravimetric concentration of particulate matter components is not a requirement as listed within the SEARs and hence has not been considered for the project. The distribution of particulate matter sizes in vehicle emissions as a function of vehicle and fuel type is well understood, and accommodated in PIAR emission factors (for ventilation design) and in the published EPA emission factors for the NSW fleet.

Additions of components on basis of weight scientifically invalid

The distribution of particulate matter sizes in vehicle emissions as a function of vehicle and fuel type is well understood, and accommodated in PIAR emission factors (for ventilation design) and in the published EPA emission factors for the NSW fleet.

Use of ventilation technique untested on this scale

Around the world, there are relatively few road tunnels with installed filtration systems, which rely on the applied ventilation technique as planned for the New M5 project. The international experience with electrostatic precipitators (ESPs) and filtration systems has been reviewed in a number of documents (e.g. Child & Associates, 2004; Willoughby et al., 2004; NHMRC, 2008; PIARC, 2008; CETU, 2010; AECOM, 2014b).

The review in section 11.2.2 of the Technical working paper: Air quality considers examples from Norway and Japan as world leaders in the construction of road tunnels (Appendix H of the EIS). In each case, the use of filtration was implemented in response to community concerns and is no longer used.

Harmful exhaust components as a proportion of reduced volume of vitiated air inside tunnel

Changes in vehicle emissions with time have been taken into account as part of the emission factors applied to calculation of the emissions inventory used in the air quality impact assessment for the project.

Issue description – use of air quality model

Submissions expressed concerns regarding the use of an air quality model that has not been used before in Australia and which cannot be verified by the NSW EPA.

- The air quality impact assessment has similar flaws to the M4 East EIS, which has been criticised by the NSW EPA and Department of Health

- The model used for the air quality impact assessment is not verified by the NSW EPA as this particular model has not been used in Australia.

Response

NSW EPA, NSW Health and the Advisory Committee on Tunnel Air Quality (ACTAQ) were all consulted during the development and production of the methodology and the air quality impact assessment provided in Appendix H (Technical working paper: Air quality) of the EIS. The methodology used for this project is consistent with the NSW Approved Methods and the recently approved M4 East project. The following comment has been made by NSW Health in its submission on the New M5 EIS (**Section 4.5** of this report):

> '*Information provided within the EIS does not demonstrate that the model used to estimate air pollution has been adequately validated. However, I do note that the model used in the EIS is the same model that was used to assess the external air quality for the proposed M4 East and that subsequently substantial additional work (mainly sensitivity studies) has been undertaken to validate the modelling work for the proposed M4 East development. As such, NSW Health is happy to accept that the model is appropriate for this EIS*.'

The EPA submission stated that:

> '*The air quality assessment (WDA 2015) has generally been conducted in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW'.*

The intention of the GRAL evaluation was to test the performance of the whole model chain, rather than GRAL per se. In this respect, and given the limited number of roadside monitoring sites in Sydney, it is considered that the model chain performs as well as could be expected, allowing for probable inherent conservatism in the approach (e.g. background concentrations, emissions).

An addendum to the NSW Chief Scientists' submission to the M4 East EIS by the peer reviewer appointed by the Advisory Committee on Tunnel Air Quality was received on 30 November 2015, and is reproduced following.

> *'Evaluation of GRAL performance*
>
> - *Upon further inspection of the data provided to me, I would like to withdraw my previous observation that 'We independently find that GRAL, as used in this assessment, is slightly (~10%) under-representing the spatial variation in concentrations related to different proximities to major roads.'*
> - *Model evaluation is particularly difficult when using data that was not explicitly designed to be captured for this purpose. Through closer inspection of the data I have gained a deeper appreciation of the complexity involved in attempting to evaluate both GRAL and the background estimates, and that this is not the purpose of the EIS.*
> - *I now believe that GRAL is generally performing well but cannot be so specific as to quantify under or over estimation.*
> - *The roadside site data available is far from ideal for model evaluation. Site F1 is affected by features (barriers, trees) which are not easily included in the model and thus F1 should ideally not be included in an evaluation (or this limitation noted). Site M1 is also very complex and challenging for the model (and not representative of the great majority of receptors where good model performance is required). The M4E:04 site ('Concord Oval') is better but only a short period of data was available which may be insufficient to cover a typical range of meteorological conditions.*
> - *However, through this extended analysis I have become more confident that the GRAMM/GRAL modelling suite are appropriate for this assessment, have been used correctly and that their performance is good.*

- *In my original review I stated:*
    - *'On a long-term basis, GRAL (as used) appears to slightly under-estimate the higher concentrations at roadside locations. This effect counter-acts the nighttime over-prediction to give apparently improved performance overall.'*

Upon further analysis I would like to withdraw this statement as I no longer believe it to be true.'

The model selection reflects the complexity of the project. There was a need to assess both surface roads (with complex changes to road network over a large area) and tunnel ventilation outlets (point sources). In addition, large numbers of real-world receiver locations were affected, to a greater or lesser extent, by the project. In a number of previous assessments separate models have been used for different types of source (e.g. CALINE for roadways and CALPUFF for ventilation outlets). This approach makes the interpretation of results more difficult, as each model involves different treatments, inputs and assumptions (e.g. meteorology, terrain, buildings). In addition, Gaussian models for roadways, such as CALINE, do not allow the effects of terrain and buildings to be taken into account. An alternative approach is to use a single model which includes different types of source. Examples of such models include ADMS in the UK and, the model used in the M4 East assessment, GRAL from Austria.

GRAL has the following advantages:

- It is an established model for regulatory applications.
- It is flexible:
    - Sources (area, line, point, portal) defined using source groups
    - Scales (streets to whole cities)
- High resolution possible (e.g. 5 metres for a large domain)
- Special algorithms for dispersion in low wind speed conditions
- Consideration of terrain and topography
- Better performance than Gaussian models (e.g. no terrain in CALINE)
- Roadway-specific (e.g. vehicle wake effects)
- Validated in a wide range of studies.

Issue description – questions about the air quality modelling and consideration of wind factors

Submissions raised specific questions about the air quality impact assessment model and how wind might affect air quality levels. Questions included:

- Whether the air quality modelling took into account the accumulation of pollutants over time if they can't be removed from the area, assuming that wind flow is not constant
- Whether the worst case scenarios take into account situations where there is no wind
- What occurs when the wind speed is very low or zero
- Request to provide modelled predictions of worst-case air quality in the vicinity of Arncliffe School and questioned whether air quality modelling predict peak concentrations at the Arncliffe School when winds direct the waste supply from the Arncliffe ventilation outlet directly towards the school.

Response

As part of the air quality impact assessment (Appendix H of the EIS) carried out for the project, likely worst case scenarios were taken into account by using a sophisticated meteorological and Lagrangian dispersion model utilising a full year of meteorological data. As this is a Langragian transport model, accumulation of pollutants under low wind speeds (down to 0.01 metres per second)

is included. 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.

Details of existing meteorology are provided in Section 6.4 of the air quality impact assessment in Appendix H of the EIS. Appendix H of the air quality impact assessment reviews the sensitivity of the model to these inputs, and hence the significance of the meteorology in determining potential air quality impacts. The probability of a worst case scenario lasting more than an hour and up to 24 hours is extremely unlikely and for it to coincide with the worst 24-hour period for dispersion would be very unlikely (refer to section 9.7 of the air quality impact assessment in Appendix H of the EIS). Under the likely worst case scenario, it was found that emissions from the ventilation outlets would have no detectable impact on local air quality. Roads and Maritime would conduct air quality monitoring to confirm the performance on the ventilation outlets.

Issue description – questions about the air quality modelling and consideration of rain factors

Submissions raised concerns about the air quality impact assessment model and how rain might affect air quality levels. Specific concerns included:

- Monitoring was undertaken in July and August 2015 and during this period a high number of rainy days occurred. There is a concern that this rain may have affected the results as the rain would have reduced the number of particles and pollutants suspended in the air.

Response

Monitoring that was undertaken in July 2015 to August 2015 relates to the New M5 monitoring stations. The time period covered by the project-specific monitoring sites was too short for them to be included in the air quality impact assessment. Nevertheless, the locations and descriptions of the project-specific monitoring sites were included for completeness.

To support the air quality impact assessment carried out for the New M5, data were obtained for the monitoring sites and periods listed in Table F-1 in Appendix H (Technical working paper: Air quality) in the EIS. This included 24 separate monitoring locations. The data from these monitoring locations provided representative air quality data against typical annual meteorological conditions.

Issue description – questions about the air quality modelling protocols and processes

Submissions raised concern that the air quality assessment fails to comply with the project SEARs and fails to provide sufficient data to adequately assess compliance with some SEARs along with specific questions about the air quality impact assessment. Specific questions included:

- In regards to the air quality impact assessment baseline monitoring, were NATA accredited laboratory and sampling protocols used?
- What are the results of the air quality impact assessment baseline monitoring?

Response

The Technical working paper: Air quality (Appendix H of the EIS) has been prepared in accordance with the SEARs issued for the project, relevant legislation, and applicable assessment guidelines and policies.

The monitoring stations from which the data was obtained are managed by OEH and Roads and Maritime using NATA accredited processes and facilities.

The results of the air quality impact assessment baseline monitoring are provided in Appendix F of the Technical working paper: Air quality (Appendix H of the EIS). The results are summarised in Section 10.5.6 of the EIS.

Issue description – questions about the air quality modelling – aviation fuel

Submissions raised specific questions about the air quality impact assessment in regards to aviation fuel. Specific questions include:

- Have particles generated from the combustion of aviation fuel been considered in the modelling?

Response

The background levels used in the air quality assessment include contributions from all existing sources of air pollution, including particles from the combustion of aviation fuel.

5.9.7 General air quality during operation

3,209 submitters raised issues regarding air quality during operation generally.

Issue description – general air quality concerns during operation of the project

Submissions expressed concerns regarding air quality impacts from the project.

Areas of concern specifically mentioned included:

- Impacts to communities such as Green Square, Enmore, Alexandria, Erskineville, Ashmore and Redfern
- Impacts to the inner west, particularly Alexandria, Erskineville, St Peters, Newtown and Sydney Park
- 'Communities surrounding the project'
- Impacts to the South Sydney and city areas
- Impacts to Arncliffe Public School
- Impacts to St Peters Pre-School
- Beverly Hills North Public School
- Impacts to the physical appearance of nearby buildings due to smog.

Examples of submissions included:

- High volumes of traffic travelling on a motorway would cause a decrease in air quality
- The toll road would increase air pollution
- The project would lower air quality standards or compromise air quality
- Traffic pollution from the proposed project would impact on air quality including the increase in carcinogens and other pollutants
- Increased traffic would impact nearby receivers (via pollution)
- Extra traffic would worsen local air quality and standard of living/quality of life within affected areas
- Nearby receivers would be impacted by poor air quality
- The gridlock caused by the project would increase pollution
- Exposure to $PM_{2.5}$ particles worsening with project operation, within project area (specifically Alexandria)
- Concern regarding fine particle pollution
- Referring to the 2014 'Initial Report on Tunnel Air Quality'- the trial of filtering the M5 showed annual health benefits which may be worth implementing.

Response

Air quality modelling results presented in the EIS demonstrate that emissions from the project ventilation outlets would have no material effect on local air quality. Roads and Maritime would

conduct ambient air quality monitoring to demonstrate that emissions from the ventilation outlets would have no detectable impact on local air quality. The relevant results would be made available to the public.

There would be a small redistribution in vehicle emissions as a result of changes in the traffic volumes on the surface road network in response to the project. The air quality impact assessment included in Appendix H (Technical working paper: Air quality) of the EIS demonstrates that changes in air quality as a result of the project would be dominated by redistribution of surface traffic, rather than emissions from the project's ventilation outlets.

Where reduction of surface traffic occurs because of traffic transferring to the New M5 tunnels, there is an improvement in air quality because the emissions from those vehicles are emitted from the elevated ventilation outlets (which are more effective at dispersing pollutants than natural air flows at ground level). The project ventilation system would be designed and operated so that it would achieve some of the most stringent standards in the world for in-tunnel air quality and the dilution and dispersion of emissions from the elevated ventilation outlets would be effective in maintaining local air quality. Emissions from the tunnel ventilation outlets would therefore have little impact on air quality in the areas surrounding the project.

Modelling indicated that the differences in pollutant concentrations between the 'do-minimum' scenario (i.e. no project) and the 'do-something' scenario (i.e. with the project) were small. Potential health risks associated with changes in air quality (specifically nitrogen dioxide and particulate matter) within the local community have been assessed and are considered to be acceptable.

The contour plots in Figures K-27, H-30, K-54, K-57, K-75, K-78, K-102, K-105, K-129, K-132, K156 and K-159 in Appendix H of the EIS show the changes in NO_2, PM_{10} and $PM_{2.5}$ with the project in 2021 and 2031 compared to the 'do nothing' scenario. . Decreases in pollutant concentrations are predicted for communities along the length of the project with increases along major road corridors. Arncliffe Public School would experience either no change or very little change in air quality. These results are a combination of emissions from surface road traffic and the ventilation outlets.

Suburbs such as Green Square, Enmore, Redfern, Newtown, South Sydney and the Sydney CBD would not be directly impacted by the project. Areas such as Alexandria and Sydney Park are include in the air quality modelling contour maps referred to above and there would be some increases in pollutants concentration around Sydney Park as a result of the project (refer to **Section 5.9.13** of this report).

The project would not generate or cause emissions with the potential for or at concentrations sufficient to alter the appearance of buildings, through staining or deposition.

Analysis of the ventilation outlet contribution (unfiltered) to the total concentrations of air pollutants has shown that this component of the total is extremely small (as shown in Figures 8-35 and 8-51 of the Technical working paper: Air quality in Appendix H of the EIS). Removing this component would result in no material change in air quality in the surrounding community. Any predicted changes in the concentration of pollutants would be driven by changes in the surface road traffic.

Only a small proportion of road tunnels around the world are equipped with air treatment systems. It has been shown that control of pollutants at the source (i.e. vehicle emissions controls) is significantly more effective in improving local and regional air quality (ACTAQ 2014 TP08, NHMRC 2008).

Arncliffe Public School is community receiver SR24. This is identified in Table 9-14 of the Air Quality Assessment Report (Volume 2C Appendix H, Chapter 9). As a community receiver, it was treated at the highest level of detail with a contemporaneous assessment of the full time series for the year. The maximum concentrations for short-term metrics at this receiver are presented within the graphs in Chapter 9 of Appendix H of the EIS.

Issue description – tunnel portals

Submissions raised concern about air quality impacts from the tunnel portals, at each end of the tunnels including at the St Peters interchange, Beaconsfield, Beverly Hills, Green Square, Alexandria and Rosebery.

Response

The design of the ventilation system would ensure zero portal emissions. Elevated ventilation outlets would be designed and constructed as described in Chapter 5 (Project description) and Chapter 6 (Construction works) of the EIS. Tunnel ventilation outlets are effective in dispersing emissions from tunnels using the momentum and buoyancy of the plume. A combination of the design height of the outlet and the amount of fresh air mixed with the air from a tunnel can be used to ensure appropriate dilution and compliance with local air quality standards.

Modelling found that emissions from the project ventilation outlets would have no material effect on local air quality. Roads and Maritime would conduct ambient air quality monitoring to demonstrate that emissions from the ventilation outlets would have no detectable impact on local air quality. The relevant results would be made available to the public.

Issue description – elevated receivers

Submissions raised concerns about air quality impacts for residents on hills or in high rise buildings, in particular Beverly Hills Girls High School and Regina Coeli Catholic School.

Response

An assessment was undertaken to determine the air quality impacts of the project on elevated receivers (elevated by buildings and terrain).

The intent of the elevated receiver analysis was twofold:

- To determine potential adverse air quality impacts on existing elevated receivers
- 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 methodology for the elevated receiver analysis is described and the results are presented in Sections 9.4.6 and Section 9.6 of the Technical working paper: Air quality (Appendix H of the EIS).

Further information on the assessment of elevated receivers is provided in **Section 4.1.2** of this report.

The implications of the results of this assessment can be summarised as follows:

- At a height of 10 metres, the maximum changes in concentration are lower than ground level
  - No adverse air quality impacts were predicted at any existing receivers to a height of 10 metres
  - Future developments to a height of 10 metres were not predicted be constrained by the ventilation outlets at any locations.
- At a height of 30 metres, the maximum changes in concentration were predicted to be larger than at 10 metres or at ground level, but increases were predicted to be localised around the Southern Connector and M4-M5 Link ventilation outlets.
  - The ventilation outlets were predicted not to result in adverse air quality impacts at any existing receivers as there are no existing buildings 30 metres or higher located close to the proposed ventilation facilities at St Peters or the Southern Connector
  - Planning controls should be developed in the vicinity of the St Peters interchange to ensure future developments at heights 30 metres or higher are not adversely impacted by the ventilation outlets. Development of planning controls would be supported by detailed modelling addressing all relevant pollutants and averaging periods
  - The future Southern Connector project should undergo appropriate impact assessment reflecting the chosen location and development in that area at the time of the project.

The Southern Connector is currently subject to development work by the Government and would be assessed as a separate EIS in the future.

5.9.8 Operational ventilation system

850 submitters raised issues regarding the design of the project ventilation system.

Issue description – unfiltered nature of the ventilation outlets

Submissions 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:

- The unfiltered nature of the ventilation facilities near sensitive receivers and highly populated suburbs (in Kingsgrove, Arncliffe, Haberfield, Alexandria and St Peters)
- The impact of unfiltered emissions from ventilation outlets in the event of light winds and temperature inversion
- That other motorway tunnels in the world have been constructed with filtration systems.

Response

Assessment of the need for filtration is provided in the Technical working paper: Air quality (Appendix H of the EIS, Section 11.2.2). This assessment determined that there was no beneficial impact on air quality by implementing tunnel air filtration, and the consequences for human health were not further assessed.

The Technical working paper: Air quality (Appendix H of the EIS) demonstrated that any predicted impact on local air quality due to emissions from the ventilation outlets would be very small. Refer to Figures K-64, K-66, K-68, K-71, K-118, K-119, K-122, K-125 in Appendix H.

Including filtration 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 the concentration of pollutants would be driven by changes in the surface road traffic.

Very few tunnels around the world are equipped with air treatment systems. There are around 60 installations of electro-static precipitators (ESP) to remove particulate matter (PM). 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. It has been shown that control of pollutants at the source, i.e. vehicle emissions controls, is significantly more effective in improving local and regional air quality (Advisory Committee on Tunnel Air Quality 2014 Technical Paper 08 (ACTAQ 2014 TP), 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.

5.9.9 In-tunnel air quality during operation

Five submitters have raised issues regarding in-tunnel air quality during operation.

Issue description – questions regarding the filtration of air within the tunnels

Submissions have raised issues around the air quality within the tunnels, highlighting a desire for filtered air within the tunnels. Specific concerns regarded the impacts on motorcycle riders.

There were also concerns regarding the cumulative effects of major tunnel pollutants and whether the mixes of these emissions would have impact on users.

One submission suggested that use of electrostatic precipitators should provide an effective and economical solution and Roads and Maritime should be required to constructively consult with competent manufacturers of filtration equipment to produce a realistically costed proposal for filtration inside the tunnel.

Response

The primary focus of pollutant reduction is at source, through design. This includes minimising road gradients, increasing the tunnel height, and providing a large tunnel cross-sectional area.

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, and is discussed in section 12.3.2 of the air quality impact assessment in Appendix H of the EIS.

While concentrations of pollutants from vehicle emissions are 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 expected to be below these guidelines. However for nitrogen dioxide and particulates, there are no health based guidelines and exposure to pollutants derived from congested traffic (including within tunnels) may increase the risk of adverse health effects. Further information on the cumulative impacts of in-tunnel air quality is addressed in **Section 5.11.5** in this report.

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.

The available evidence for the use of electrostatic precipitators as a method of filtration is not cost-effective or appropriate for the M5 project due to general effectiveness.

5.9.10 Impacts related to non-specific ventilation outlets

1,002 submitters raised issues regarding ventilation outlets generally.

Issue description – location of ventilation outlets near receivers

Submissions have expressed concern around the location of ventilation outlets being near sensitive receivers (including residents) and in surrounding suburbs such as local parks and playgrounds.

Response

The air quality impact assessment in Appendix H (Technical working paper: Air quality) of the EIS determined that emissions from the project ventilation outlets, even in the regulatory worst case scenarios, would not result in adverse impacts on local air quality. This would be confirmed by conducting ambient air quality monitoring to demonstrate that emissions from the ventilation outlets would have no detectable impact on local air quality, including on sensitive community receivers such as child care centres and playgrounds.

5.9.11 Impacts relating to the Kingsgrove ventilation outlet

472 submitters raised issues regarding the Kingsgrove ventilation outlet.

Issue description – location of Kingsgrove ventilation outlet near receivers

Submissions have expressed concern around the location of the Kingsgrove ventilation outlet being near sensitive receivers including schools (e.g. McCallums Hill Primary School).

Response

The Kingsgrove ventilation outlet contributions to PM_{10} and $PM_{2.5}$ have been modelled as being negligible (refer to Figures K-64, K-66, K-68, K-71, K-118, K-120, K-122, K-125 in Appendix H of the EIS). Emissions from the Kingsgrove ventilation outlet would cause no material change in air quality at any nearby sensitive receivers, including the McCallums Hill Primary School.

Issue description – unfiltered ventilation outlet

Submissions expressed concern about the unfiltered nature of the Kingsgrove ventilation outlet.

Response

The air quality impact assessment in Appendix H of the EIS shows that the emissions from the ventilation outlet at Kingsgrove ventilation outlet would cause no material change in air quality at any nearby sensitive receivers. Figure 9-81 in Appendix H of the EIS shows the annual mean $PM_{2.5}$ concentration as a result of operation of the Kingsgrove ventilation outlet being between 0.02 and 0.03 µg/m^3 in 2021 relative to the annual mean reporting standard of 8 µg/m^3. As explained in **Section 5.9.8** of this report, there would be no material benefit in providing filtration at the Kingsgrove ventilation outlet.

5.9.12 Impacts relating to the Arncliffe ventilation outlet

233 submitters have raised issues regarding the Arncliffe ventilation outlet.

Issue description – location of Arncliffe ventilation outlet near receivers

Submissions have raised issues around the location of the Arncliffe ventilation outlet being near sensitive receivers including schools and the associated health impacts.

Response

The Arncliffe ventilation outlet contributions to PM_{10} and $PM_{2.5}$ have been modelled as being negligible (refer to Figures K-64, K-66, K-68, K-71, K-118, K-120, K-122, K-125 in Appendix H of the EIS). Emissions from the Arncliffe ventilation outlet would cause no material change in air quality at any nearby sensitive receivers. Impacts relating to the St Peters interchange ventilation outlet.

5.9.13 Impacts relating to the St Peters ventilation outlet

1,197 submitters have raised issues regarding the St Peters ventilation outlet.

Issue description – location of St Peters ventilation outlet near receivers

Submissions have raised concerns around the location of the St Peters ventilation outlet being near sensitive receivers / high density residential area.

One submission raised concern that the EIS did not mention that a second ventilation outlet would be required at St Peters for WestConnex Stage 3 (the M4-M5 Link), as this would further worsen the air quality impacts on Newtown.

Response

The St Peters ventilation outlet contributions to PM_{10} and $PM_{2.5}$ have been modelled as being negligible (refer to Figures K-64, K-66, K-68, K-71, K-118, K-120, K-122, K-125 in Appendix H of the EIS). Emissions from the St Peters ventilation outlet would cause no material change in air quality at any nearby sensitive receivers. It is acknowledged that an additional ventilation facility would be required for the future M4-M5 Link, which is in the early stages of design development. An indicative location for the M4-M5 Link ventilation facility has been presented in the New M5 EIS and used as a basis for assessing potential cumulative air quality impacts.

The air quality impact assessment for the project considers the contributions from a future M4-M5 Link ventilation facility at St Peters within the 2031 ‘do something’ cumulative scenario. This is discussed in Section 10.1.6 in the EIS, as well as Section 2.4.1 of Technical working paper: Air quality (Appendix H of the EIS). The results are discussed in Section 10.9 of the EIS and Chapter 10 of the technical working paper.

Issue description – impact of the St Peters ventilation outlet on air quality at Sydney Park

Submissions have expressed concern around air quality impacts (non-specific) to Sydney Park as result of the project. There were also specific concerns for the levels of fine particle pollution at Sydney Park.

Response

The results referred to in the previous response (refer to **Section 5.9.13(1)** above) apply to Sydney Park so that the contribution from the ventilation outlet to fine particle pollution is very low. Refer also the response regarding the impact of surface roads around Sydney Park in **Section 5.9.14(1)** of this report.

Issue description – unfiltered ventilation outlet

Submissions have expressed concern about the lack of filtration proposed for the St Peters ventilation outlet and the future impacts to Newtown and the surrounding St Peters area.

Due to the location of St Peters in proximity to the airport, it was also raised that the ventilation tunnels may not be as high, and may impact on health due to the unfiltered nature.

Response

As detailed in the response provided in **Section 5.9.13(1)** of this report, emissions from the St Peters ventilation outlet are would not adversely affect local air quality and the health of nearby receivers. The reason that filtration is not proposed for the ventilation outlet at St Peters is explained in **Section 5.9.8(1)**.

The ventilation system for the New M5 project at the St Peters interchange has been designed to meet the air quality requirements for all receivers and to meet the requirements of the Civil Aviation Safety Authority in relation to impacts of a ventilation plume in the atmosphere near the Sydney Airport. Whilst the physical heights of the ventilation outlets are consistent across the project, the associated exit velocities of the ventilation plumes in the atmosphere (i.e. the speed of the air emerging from the ventilation outlet) would vary to meet the competing design requirements outlined previously.

5.9.14 Impacts from surface roads

2,370 submitters have raised issues regarding air quality impacts from surface roads.

Issue description – increase in air pollution from surface roads around St Peters and Sydney Park

Submissions have expressed concern that increased traffic on surface roads in the vicinity of St Peters as a result of the New M5 Motorway and the re-direction of traffic to new areas (including 'rat-runs' through local streets) would result in increased air pollution. Submissions also raised concern about the St Peters interchange itself increasing air pollution.

Response

Much of the community would experience no change or a small improvement in air quality as a result of the project. It is acknowledged that there are some discrete areas (notably the St Peters area) where there is predicted to be an increase in pollutant concentrations as a direct result of increases in surface road traffic related to the project. Figure 9-49, Figure 9-69 and Figure 9-80 in Appendix H of the EIS show the change in maximum one-hour NO_2, maximum 24-hour PM_{10} and maximum 24-hour $PM_{2.5}$ concentrations, respectively, with the project in 2021 compared to the 'do nothing' scenario. These results show that there are predicted increases in concentrations at St Peters adjacent to Campbell Road and Euston Road. Potential health impacts associated with changes in air quality have been assessed and are considered negligible. Potential health risks associated with changes in air quality (specifically nitrogen dioxide and particulate matter) within the local community have been assessed and are considered to be acceptable.

Issue description – long term impacts of air pollution

Submissions expressed concern about the lack of information in the EIS regarding the long term impacts of air pollution resulting from increased traffic volumes.

Response

The air quality impact assessment for the project includes modelling of the potential air quality impacts of the project up to the year 2031. This future year allows for full ramp-up of traffic demand as

travellers respond to the provision of the fully completed WestConnex program of works and introduction of associated tolls. The results from these long term potential impacts are provided in section 10.8.2 of the EIS. Further detail, including contour maps showing changes in pollutant levels for the future years, can be found in Appendix H of the EIS.

The EIS seeks approval to construct tunnels as follows:

- Between the western portals and Arncliffe the tunnels would be built to be three lanes wide, but marked for two lanes
- Between Arncliffe and St Peters the tunnels would be built to be five lanes wide but marked for two lanes.

The EIS seeks approval to operate the tunnel with only two marked lanes of traffic and demonstrates the ventilation has sufficient capacity to readily achieve the ventilation design criteria. Furthermore, the EIS makes it clear (Section 5.1) that any change from a two lane tunnel would be subject to future environmental assessment and approval.

Should a decision be made in the future to seek approval to increase the number of trafficable lanes in the tunnel to greater than two, the capacity of the ventilation system would be reviewed at that time and any changes required would be proposed as part of a separate environmental assessment process.

Issue description – air quality impacts from increased traffic

Submissions expressed concern that air quality would be impacted and pollution levels increased due to increased traffic, including the placement of WestConnex exit roads, an increase in $PM_{2.5}$ particles and impacts to businesses. Specific areas mentioned within submissions included:

- Inner west
- Alexandria, particularly the impacts to schools in this area located next to main roads and Euston Road to Maddox Street
- Between King Georges Road and the new tunnel
- Major arterial roads such as King Georges Road, Euston Road, Campbell Road and Stoney Creek Road
- Local streets such as Taroonga Terrace, Mitchell Road, Enmore Road, Erskinville Road, Edgeware Road and Moorefields Road
- Erskineville.

Response

The contour plots in Figures K-27, H-30, K-54, K-57, K-75, K-78, K-102, K-105, K-129, K-132, K156 and K-159 in Appendix H of the EIS show the predicted changes in concentration for NO_2, PM_{10} and $PM_{2.5}$ with the project in 2021 and 2031 compared to the 'do nothing' scenario. The annual mean $PM_{2.5}$ concentrations at the 35 community receivers (refer to Table 10-15 in Chapter 10 of the EIS), which includes schools, are shown in Figure 9-73 in Appendix H of the EIS. Figure 9-74 shows that the highest contribution to these levels is the background concentration, measured against an assumed background concentration of 8 $\mu g/m^3$ (the *National Environmental Protection (Ambient Air Quality) Measure* advisory reporting standard). There are predicted to be exceedances of this reporting standard and the proposed NSW target (i.e. non-mandatory) of 7.0 $\mu g/m^3$ with or without the project.

The spatial changes in air quality as a result of the project would be quite complex, reflecting the complex changes in traffic on the surface road network. Substantial reductions in vehicle emissions concentrations have been predicted along the M5 East Motorway east and west of the existing M5 East tunnels, as well as along General Holmes Drive and other roads around the airport.

Reductions in concentrations were also predicted along the section of King Georges Road to the north of the M5 East Motorway, around the northern perimeter of Sydney Park, and on a number of other roads. However, increases in concentration have been predicted for King Georges Road to the south of the M5 East Motorway, along Stoney Creek Road, Bexley Road to the south of the M5 East

Motorway, Harrow Road, Bay Street, Forest Road, and around the southern perimeter of Sydney Park, amongst other roads.

Where increases in pollutant concentration at receivers were predicted, these were mostly small. Very small proportions of receivers have been predicted to have larger increases. Figure 9-75 in Appendix H of the EIS shows the change in annual mean $PM_{2.5}$ concentrations at the 35 community receivers. The changes in concentration with the project were generally in the range of plus or minus 0.2 µg/m^3.

Issue description – air quality impacts from widening the road

Submissions have expressed concern that air quality near residential buildings would be impacted by widening roads and bringing traffic in close proximity to dwellings.

Response

Roads that would be widened as part of the project are as follows:

- The M5 East Motorway at Kingsgrove which would consist of:
  - Four new dedicated through lanes (two in each direction) to connect the M5 South West Motorway and King Georges Road to the New M5
  - Two new bypass lanes comprising an eastbound and a westbound ramp connecting the King Georges Road interchange and the M5 East Motorway, bypassing the New M5
- Local road upgrades at St Peters, Alexandria and Mascot, including:
  - Sections of Euston Road, Campbell Street, Bedwin Road, Campbell Road, Bourke Street, Bourke Road and Gardeners Road

Much of the community would experience no change or a small improvement in air quality as a result of the project. It is acknowledged that there are some discrete areas (notably St Peters) where there is predicted to be an increase in pollutant concentrations as a direct result of increases in surface road traffic related to the project. 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.

5.9.15 Improvements on surface roads

One submitter raised issues regarding air quality improvements along surface roads.

Issue description – improvements to air quality resulting from diverted traffic

Submissions have expressed support for the improvements to air quality along surface roads, as a result of diverted traffic, including heavy vehicles. Surface roads mention included:

- The Princes Highway.

Response

The support for the project is noted.

5.9.16 Odour impacts during operation

Three submitters raised issues regarding odour impacts during construction.

Issue description – odour associated with increase in traffic

Submissions have expressed concern about the increase in traffic volumes on local streets, particularly surrounding St Peters Pre-School, and the associated odours or ‘stench’ from this increase.

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 *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DEC, 2005) . There are no odour criteria in the 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 Approved Methods.

5.9.17 Tunnel support facilities

No issues raised in community submissions were categorised under 'air quality impacts from tunnel support facilities'.

5.9.18 Air quality monitoring during operation

15 submitters raised issues regarding air quality monitoring during operation of the project.

Issue description – location of future air quality monitoring devices

Submissions have expressed concern about the location of the ventilation outlets adjacent to parks and open space, as these areas are generally clearer and may skew future air quality readings. Within submissions it was also suggested that monitoring devices are located at or nearby sensitive receivers. Specifically, there was concern within one submission that the monitoring station on the St Peters Public School grounds does not conform to regulations regarding the distance from roads and car parks, and would impact on future data collection.

One submission suggested that an air quality monitoring system should be installed at Arncliffe Public School.

Response

The contributions of the ventilation outlets to pollutant concentrations at sensitive receivers are predicted to be small. It is unlikely that the air quality impacts from the project ventilation outlets would be measureable above background air quality.

An air quality monitoring scheme would 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 locations would be sited to provide a representative indication of the operational air quality impacts of the project, and may include monitoring locations near sensitive receivers.

Monitoring results would be reviewed after an appropriate period to determine if there is a need to continue monitoring. All relevant monitoring results would be made publicly available.

The monitoring site at St Peters Public School is an urban background site. In densely populated urban areas it is difficult to find an 'ideal' background monitoring location. However, the St Peters Public School site complies, as far as possible, with the recommendations of Australian Standard *AS/NZS 3580.1.1:2007 - Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment*. The roads nearest to the monitoring station are only very lightly trafficked and would have little influence on the measured air quality.

Issue description – future air quality monitoring methodology

Submissions raised questions regarding the future methodology of air quality monitoring (both ambient and in-tunnel) during the operation of the M5 project. Specific submissions questioned whether smog tests would be conducted before and after the construction and operation of the project to determine the impacts on health and whether there are more sensitive measurement techniques and / or statistical tests to measure the increase in levels of pollutants from tunnel ventilation.

One submission raised a question regarding the contingency mitigation measures if air quality impacts from construction and/or operation are significantly worse than predicted.

Response

During operation, continuous in-tunnel monitoring would be undertaken to demonstrate on-going compliance with the in-tunnel emission limits. Continuous monitoring would also be undertaken in the ventilation outlets to demonstrate on-going compliance with the emission limits. Monitoring would include exit velocity and temperature.

An ambient air quality monitoring scheme would 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 would be reviewed after an appropriate period to determine if there is a need to continue monitoring.

All relevant monitoring results would be made publicly available.

Chapter 30 of the EIS provides a summary of the environmental management measures for the project. These measures have been reviewed having regard to issues raised in submissions, and a revised summary of environmental management measures is provided in **Chapter 8** (Revised environmental management measures) of this report. Numerous management measures are proposed to be implemented during the construction phase in and around the construction ancillary facilities, which would minimise impacts on surrounding residences and businesses to the greatest extent practicable.

5.9.19 Cumulative operational impacts

248 submitters raised issues regarding cumulative operational impacts.

Issue description – cumulative air quality impacts

Submissions raised concerns that the project would have air quality impacts with regard to other road systems including:

- The sheer scale of WestConnex means that changes in air quality would be significant
- Impacts from extra diesel trucks and dust over the entire WestConnex program of works
- Compounded impacts to Wolli Creek and Arncliffe from the addition of New M5 outlets to the Turella ventilation outlet
- Impacts on Sydney's overall air quality
- Impacts from additional air pollution to what currently exists from the M5 and major arterials such as King Georges Road.

Response

The existing M5 East ventilation outlet is included in the GRAL air quality model applied to the assessment of the project and therefore all of the results shown in Chapter 10 and Appendix H of the EIS include the cumulative impacts of the existing M5 East ventilation outlet at Turella and the ventilation outlets for the New M5.

The cumulative impacts of all the WestConnex projects were modelled and the resulting concentrations at assessed receiver locations were broadly similar to the 2031 results with only the New M5 project. This is primarily due to the diversion of surface road traffic into the tunnels of the New M5 and the future proposed M4–M5 Link combined with the effectiveness of the elevated ventilation outlets in dispersing emissions. Other factors would also contribute to improved air quality, such as the improvement in vehicle emission technology over time. The results for the expected traffic scenarios and all pollutants are presented in Appendix K of the air quality impact assessment included in Appendix H (Technical working paper: Air quality) of the EIS.

5.9.20 NSW EPA Policy

One submitter raised issues regarding the new NSW standards for air quality.

Issue description – NSW EPA policy and international standards

Submissions raised concern that the new NSW standards for air quality are below international standards.

Response

Applicable air quality standards in New South Wales are set by the Environment Protection Authority, having to national and international practice, and taking into account local conditions and regulatory requirements.

A review of international health-related ambient air quality standards (Table C-4 in Appendix C of Appendix H of the EIS) shows that the annual mean $PM_{2.5}$ of 8µg/m^3 is the most stringent standard in the world, including the World Health organisation standard and the 24-hour mean $PM_{2.5}$ of 25µg/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 30µg/m^3 and, although the European Union and the United Kingdom have a higher criterion of 40µg/m^3, the lowest or most stringent standard for annual mean PM_{10} in the world is Scotland with a criterion of 18µg/m^3.

5.10 Noise and vibration

5.10.1 Level and quality of the construction assessment

1,510 submitters have raised issues regarding the level and quality of the construction noise and vibration assessment.

Issue description – adequacy of assessment

Submissions have raised concerns that the impacts of noise and vibration 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
- Concerns that noise baseline monitoring had been insufficient to assess impacts during construction, as well as requests that additional monitoring be conducted prior to and after construction to determine impacts, including on the health of residents
- That there is insufficient information on numbers and locations of equipment to assess the noise impacts of concurrent activities
- Inaccuracies in some of the tables in the report make the assessment unreliable.

Response

The assessment of construction noise and vibration in Section 12.4.1 and Appendix J (Technical working paper: Noise and vibration) of the EIS has been undertaken in accordance with the Secretary's Environmental Assessment Requirements (SEARs) and the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009). The scope of the assessment is comparable to construction noise assessments carried out for other major infrastructure projects. The 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.

Noise modelling was undertaken to predict noise levels at surrounding receiver locations. The noise monitoring locations are shown in Figure 12-2 to Figure 12-10 of the EIS. Detailed observation notes for the unattended background noise monitoring measurements are included in Appendix D of the Technical working paper: Noise and vibration (Appendix J of the EIS).

A noise monitoring program would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress.

Potential impacts to human health from noise and vibration during construction are assessed in Section 11.3.1 and Appendix I (Technical working paper: Human health) of the EIS. Submissions relating to human health impacts from noise and vibration have been responded to in **Section 5.11.7** of this report.

Construction activities for the project are described in detail in Chapter 6 of the EIS and in Section 2.2 of the Technical working paper: Noise and vibration (Appendix J of the EIS).

Assessed construction activities, their locations, and whether the works would be undertaken during the daytime, evening and night-time periods are provided in Table 32 and Table 33 of the Technical working paper: Noise and vibration at Appendix J of the EIS. The noisiest construction activities have been considered for the assessment. Sound power levels corresponding with indicative plant and equipment to undertake these works are provided in Table 34 and Table 35 of the Technical working paper: Noise and vibration (Appendix J of the EIS). The range and types of equipment used would be confirmed during the detailed design phase.

Construction activities and anticipated plant and equipment 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. Cumulative construction noise impacts were also assessed for the worst case scenario (ie a scenario where all equipment is operational during a fifteen minute period and in the worst possible location). This approach is likely to overestimate potential construction noise impacts, because in practice, the likelihood of all construction plant and equipment operating simultaneously is low.

Additional detail regarding the assessment of cumulative construction noise is provided in Section 12.4.1 of the EIS. Submissions relating to cumulative construction noise have been responded to in **Section 5.10.8** of this report.

Issue description – assessment of construction noise impacts at Arncliffe Public School

Concerns were raised over the absence of a construction noise and vibration assessment for the Arncliffe Public School.

Response

The Arncliffe Public School is outside of the study area for the noise and vibration assessment presented in the EIS. The school is outside the area anticipated to experience significant changes in noise levels as a result of the project.

Construction traffic noise levels during the AM and PM peak and non-peak periods are shown in Table 12-42 to Table 12-45 of the EIS. The assessment of construction traffic noise indicates that construction traffic (heavy vehicles and light vehicles) is unlikely to result in a noticeable increase in L_{Aeq} noise levels at the Arncliffe Public School.

Construction traffic noise has been assessed at two locations near to Arncliffe Public School – along the Princes Highway (south of Forest Road) and along Wickham Street. The relative noise increases from project construction traffic along the Princes Highway (south of Forest Road) are predicted as being:

- AM peak period (6.30am to 9.30am) - relative noise increase of around 0.4 dB(A)
- AM off-peak period (9.30am to 3.30pm) – relative noise increase of around 0.6 dB(A)
- PM off-peak period (3.30pm to 7.00pm) – relative noise increase of around 0.5 dB(A)
- PM off-peak period (7.00pm to 6.30am) – relative noise increase of around 2.4 dB(A).

The relative noise increases from project construction traffic along Wickham Street are predicted as being:

- AM peak period (6.30am to 9.30am) - relative noise increase of around 0.8 dB(A)
- AM off-peak period (9.30am to 3.30pm) – relative noise increase of around 1.1 dB(A)

- PM off-peak period (3.0pm to 7.00pm) – relative noise increase of around 0.8 dB(A)
- PM off-peak period (7.00pm to 6.30am) – relative noise increase of around 3.3 dB(A).

The assessment concluded that for receivers along the Princes Highway (south of Forest Road) and receivers along Wickham Road, the relative noise increase from project construction traffic would be less than 2 dB(A) during all periods within which the school would be in use, with minor exceedances predicted during the PM off-peak (ie at night). Construction traffic noise impacts at the Arncliffe Public School would be even lower than this, because the school is located further away from construction haulage routes than the assessed receivers along the Princes Highway and along Wickham Road.

Relative noise increases below 2 dB(A) during the AM and PM peak and AM off-peak periods would be attributable to relatively high background levels of traffic and associated traffic noise during all periods of the day along these roads. The predicted minor relative noise increase from project construction traffic during the PM off-peak period would have a negligible impact on the operation of the school as this would occur during the quietest periods of the night time, when the school would generally not operate.

Because the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009) does not provide specific guidance in relation to acceptable noise levels associated with construction traffic, the noise increase criterion described in the RNP (ie 2 dB(A)) has been adopted for assessment of the project. Under the RNP, an increase of up to 2 dB(A) is a minor impact that is considered barely perceptible to the average person. Where the road traffic noise levels are predicted to exceed 2 dB(A) as a result of construction traffic noise from traffic associated with the project, feasible and reasonable noise management measures would be considered to reduce potential noise impacts and preserve acoustic amenity. These would be detailed in the Construction Noise and Vibration Management Plan(s) and implemented in accordance with the ICNG. Further discussion on noise management measures is provided in Section 12.5 of the EIS.

Appendix K of the Technical working paper: Noise and vibration (Appendix J of the EIS) includes maps showing areas that may be affected by vibration during construction of the project. The maps indicate that the project would not have vibration impacts on the Arncliffe Public School.

Issue description – noise catchment area NCA 4 clarification

A submitter queried whether residences along Campbell Road were included in noise catchment area (NCA) NCA 4 in the noise and vibration assessment.

Response

The group of residences along Campbell Road are located in NCA 4. The extents of NCAs is shown in Appendix C of the Technical working paper: Noise and vibration (Appendix J of the EIS).

The full results of the construction noise assessment are presented in Section 5.1 of the Technical working paper: Noise and vibration (Appendix J of the EIS).

5.10.2 Airborne noise during construction

1,219 submitters have raised issues relating to airborne noise impacts as result of construction activities.

Issue description – general airborne noise impact concerns

Submissions have raised concerns regarding noise impacts during the construction of the project. In summary, issues included:

- Concern regarding construction noise impacts on dwellings and communities
- Concern regarding construction noise impacts on schools
- Concern regarding construction noise impacts on the amenity of public open space
- Duration of construction noise, exceedances of noise management levels and impacts on residents

- Concerns that the EIS did not include sufficient detail regarding the types of construction noise management measures that would be implemented.

Response

An assessment of construction noise is included in Section 12.4.1 and Appendix J (Technical working paper: Noise and vibration) of the EIS. The assessment has been conducted in accordance with the SEARs and the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009). Noise modelling was conducted to predict noise levels at surrounding receiver locations.

A summary of the impacts to receivers from construction noise and vibration is provided in Section 12.4.1 of the EIS and details predicted exceedances of the noise management levels. Noise management levels are the threshold above which further consideration of feasible and reasonable noise mitigation is required. The assessment has considered impacts to all receiver types as identified in the ICNG including residences, schools and areas of public open space.

In accordance with the ICNG, the assessment of construction noise impacts is conservatively based on the worst case 15-minute period of construction activity and does not necessarily represent the noise impact at noise sensitive receivers for an extended period of time. For example, particularly noisy activities such as rock hammering and the use of concrete saws are likely to persist for only a small proportion of the overall construction period. Further, the assumption that all construction plant and equipment would be operating simultaneously has a low likelihood of occurring in practice.

Additionally, the construction noise predictions use the shortest separation distance to each sensitive receiver. This is a conservative assumption and would tend to overestimate noise emissions from construction activities being carried out further away from sensitive receivers.

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. Details on the length of exposure to construction activities are not available at this stage of the project. This would be available during detail design and for the Construction Noise and Vibration Management Plan. Opportunities to reduce construction timeframes while protecting local amenity would be considered during detailed design and construction planning in consultation with key stakeholders and the community.

Specific feasible and reasonable management measures would be investigated during detailed design. This may include:

- Construction site noise would be managed via consideration of the layout of construction compound sites to maximise distance and shielding to nearby receivers
- Appropriate plant and equipment would be selected for each task to minimise noise contributions
- Where feasible and reasonable, alternative work methods such as the use of hydraulic or electric-controlled units in place of diesel units would be considered and implemented
- The use of alternative machines that perform the same function (such as rubber wheeler plant) would be considered in place of steel tracked plant, and noisy equipment would be orientated away from residential receivers where feasible and reasonable
- Where practicable, consideration would be given to permanent noise barriers being scheduled for completion as early as possible in the construction program to assist in mitigating construction noise
- Where feasible and reasonable the use of temporary noise walls or hoardings would be investigated where works or compounds are in close proximity to residential receivers
- At tunnelling support sites, stockpiling and spoil handling would occur within acoustic or non-acoustic sheds, reducing potential noise impacts

- Noise monitoring would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities (such as schools, aged cared facilities etc.) at the commencement of activities and periodically during the construction program as the works progress.

Where exceedances of construction noise management levels are anticipated both within and outside standard construction work hours, the ICNG recommends strategies for noise mitigation and control. A construction noise and vibration management plan would be developed and implemented and would identify the receiver specific mitigation and management measures to be implemented. In selecting specific management measures, the Construction Noise and Vibration Management Plan would take into account the number and sensitivity of potentially affected receivers, the nature and duration of relevant construction activities, and the availability of additional feasible and reasonable management measures.

Additional construction noise mitigation and management measures would include:

- Letterbox drop – notification of construction activities as part of periodic community updates distributed across areas surrounding construction activities
- Noise verification – receiver or catchment specific noise verification used to confirm the construction noise performance of the project and to proactively inform, where relevant, review and update noise mitigation and management measures, and site construction practices
- Individual briefing – offers of individual briefings about relevant construction activities and potential impacts with potentially affected receivers
- Receiver specific notifications – individual correspondence to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Receiver specific contact – individual phone calls, emails or visits to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Respite periods – programming of feasible and reasonable respite periods for potentially affected receivers
- Alternative accommodation – offers of reasonable alternative accommodation for receivers potentially affected by construction activities conducted at night (from 10.00pm to 7.00am). Alternative accommodation would be subject to consultation with the affected receiver and would take into account the duration and intensity of the potential impact.

Ongoing noise monitoring would be undertaken during construction at sensitive receivers during critical periods to identify and assist in managing high risk noise events.

Under the ICNG, noise management levels for passive recreation land uses differ to those for residential receivers and are generally based on the principle that the characteristic activities for the particular land use should not be unduly disturbed. The management level ($L_{Aeq(15minute)}$) for passive recreation areas under the ICNG is 60 dB(A).

Appendix H of the Technical working paper: Noise and vibration (Appendix J of the EIS) identifies that Sydney Park would experience moderate exceedances (around 13 dB(A)) of the applicable noise management levels during kerbage and drainage works associated with the local road upgrade works. As these works would primarily be undertaken during the night time to limit impacts to the operability and safety of the road network, these exceedances would not be expected to have a significant impact on the amenity of the park for recreational users.

Section 14.5.2 of Appendix I of the EIS and Section 10.7.2 of the EIS (as amended by **Chapter 8** (Revised environmental management measures) of this report) identifies the strategies for construction noise mitigation and control which are applicable to the project.

Issue description – highly noise affected receivers

Submissions expressed concern that some receivers would be highly noise affected for periods of more than two years during construction, noting that this would be an unreasonable burden for those affected, particularly for receivers who would also be affected by noise from the operation of the project. Submissions referenced specific areas including Alexandria and St Peters.

Submissions also requested information regarding noise mitigation and management measures which would be implemented during construction, including whether at-property acoustic treatment would be available for affected receivers.

Response

A highly noise affected receiver is one who is anticipated to experience construction noise of 75 dB(A) or more ($L_{Aeq(15\text{-}minute)}$). Some receivers would be highly noise affected by construction noise during standard construction hours (refer to Table 12-17 to Table 12-29 of the EIS for predicted exceedances) including some receivers around Alexandria and St Peters. The tables show that:

- Receivers most highly affected by noise would experience this as a result of local road upgrade works, particularly kerbing, drainage activities and road tie-in works
- There are few other high noise affected receivers resulting from other construction activities, including during construction site establishment, utility installation and relocation, as well as construction compound activities.

In accordance with the ICNG the assessment of construction noise impacts is conservatively based on the worst case 15-minute period of construction activity and does not necessarily represent the noise impact at noise sensitive receivers for an extended period of time. For example, particularly noisy activities such as rock hammering and the use of concrete saws are likely to persist for only a small proportion of the overall construction period. Additionally, the construction noise predictions use the shortest separation distance to each sensitive receiver. This is a conservative assumption and would tend to overestimate noise emissions from construction activities being carried out further away from sensitive receivers.

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. Opportunities to further reduce construction timeframes while protecting local amenity would be considered during detailed design and construction planning.

Feasible and reasonable management measures which would be considered during the construction of the project to minimise impacts to highly noise affected receivers would include:

- Construction site noise would be managed via consideration of the layout of construction compound sites to maximise distance and shielding to nearby receivers
- Appropriate plant and equipment would be selected for each task to minimise noise contributions
- Where feasible and reasonable, alternative work methods such as the use of hydraulic or electric-controlled units in place of diesel units would be consisted and implemented
- The use of alternative machines that perform the same function (such as rubber wheeler plant) would be considered in place of steel tracked plant, and noisy equipment would be orientated away from residential receivers where feasible and reasonable
- Where practicable, consideration would be given to permanent noise barriers being scheduled for completion as early as possible to assist in mitigating construction noise
- Where feasible and reasonable the use of temporary noise walls or hoarding would be investigated where works or compounds are in proximity to residential receivers
- Noise monitoring would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress.

Where exceedances of construction noise management levels are expected both within and outside standard construction work hours, the ICNG recommends strategies for noise mitigation and control. A Construction Noise and Vibration Management Plan would be developed and implemented and would identify receiver specific mitigation and management measures to be implemented. In selecting specific management measures, the Construction Noise and Vibration Management Plan would take into account the number and sensitivity of potentially affected receivers, the nature and duration of

relevant construction activities, and the availability of additional feasible and reasonable management measures.

Additional construction noise mitigation and management measures could include:

- Letterbox drop – notification of construction activities as part of periodic community updates distributed across areas surrounding construction activities
- Noise verification – receiver or catchment specific noise verification used to confirm the construction noise performance of the project and to proactively inform, where relevant, review and update noise mitigation and management measures, and site construction practices
- Individual briefing – offers of individual briefings about relevant construction activities and potential impacts with potentially affected receivers
- Receiver specific notifications – individual correspondence to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Receiver specific contact – individual phone calls, emails or visits to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Respite periods – programming of feasible and reasonable respite periods for potentially affected receivers
- Alternative accommodation – offers of reasonable alternative accommodation for receivers potentially affected by construction activities conducted at night (from 10.00pm to 7.00am). Alternative accommodation would be subject to consultation with the affected receiver and would take into account the duration and intensity of the potential impact.

Ongoing noise monitoring would be undertaken during construction at sensitive receivers during critical periods to identify and assist in managing high risk noise events including impacts to highly noise affected receivers.

Issue description – noise and vibration impacts from Alexandria Landfill clean-up

A submitter raised concerns that noise and vibration associated with the Alexandria Landfill clean-up was affecting nearby receivers.

Response

Clean up work and stockpile removal work is currently underway at the Alexandria Landfill site to make it ready for landfill closure works. The current activities at the Alexandria Landfill are authorised under existing approvals and licences and are outside the scope of the New M5 project.

5.10.3 Ground-borne noise and vibration from tunnelling works

631 submitters have raised issues relating to ground-borne noise and vibration impacts as result of tunnelling activities.

Issue description – noise and vibration from tunnelling works

Concerns were raised regarding noise and vibration from tunnelling works, including concerns relating to works during the evening and night-time periods. Specific concerns included:

- The EIS does not adequately assess ground-borne noise and vibration from tunnelling works. The lack of assessment of potential impacts to areas around Tempe was mentioned specifically
- The EIS deliberately attempts to downplay the noise and vibration impacts to communities associated with tunnelling activities
- The EIS does not define what a ‘short time’ is in terms of vibration from tunnelling works which would be experienced by receivers at the surface.

Response

An assessment of construction noise and vibration is provided in Section 12.4.1 and Appendix J (Technical working paper: Noise and vibration) of the EIS. The assessment includes consideration of potential ground-borne noise and vibration impacts from tunnelling activities. This assessment has

been carried out in accordance with the SEARs and the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009).

The maps in Appendix J and Appendix K of the Technical working paper: Noise and vibration (Appendix J of the EIS) show the predicted construction ground-borne noise and ground-borne vibration impacts to receivers from tunnelling activities. The maps indicate the areas above the tunnel where the relevant criteria are predicted to be exceeded. In general, vibration is more likely to be felt by receivers in the shallower sections of the tunnels, close to the tunnel portals.

Through optimisation of the tunnel design to ensure safe passage under the Cooks River and other infrastructure, the tunnel would be located at a more significant depth in the vicinity of Tempe.

The suburb of Tempe was considered in the assessment of ground-borne noise and vibration, and as shown in the maps in Appendix J and Appendix K of the Technical working paper: Noise and vibration (Appendix J of the EIS):

- The night time ground-borne noise criterion of 35 dB(A) is exceeded along a thin strip of land through the Tempe Recreation Reserve, immediately above tunnelling works
- No exceedances of vibration criteria are anticipated in Tempe as a result of tunnelling works.

Ground-borne noise

The assessment of ground-borne noise indicates that there would be exceedances of the ground-borne noise criteria during the evening and night-time periods at some receivers. These impacts would be limited in duration and would only affect receivers while tunnelling activities were being conducted beneath and / or in proximity to the receivers.

Tunnelling would typically progress around a maximum of seven metres per day, thus it is likely that ground-borne noise would be discernible for up to five days at each affected receiver with exceedances occurring for up to two days. Tunnelling advance rates would reduce to two to five metres per day around the tunnel portals, which may increase the duration of exposure for receivers in these areas. As tunnelling moves towards and away from each receiver the ground-borne noise levels experienced would be lower.

Opportunities for feasible and reasonable management measures to reduce these noise impacts would be considered during the detailed design process as part of the development of Construction Noise and Vibration Management Plans.

Vibration from tunnelling

The assessment of construction vibration impacts from tunnelling works found that the preferred levels for human comfort may be exceeded at a number of receivers during the night-time. However, the maximum level for human comfort would not be exceeded. Vibration levels would not exceed the structural damage criteria. Receivers at the surface would generally experience vibration for the same time period that ground-borne noise would be expected (i.e. discernible for up to five days at each affected receiver with exceedances occurring for up to two days).

As tunnelling advance rates would reduce to two to five metres a day around the portals, this may increase the duration of exposure for receivers in these areas. As tunnelling moves towards each receiver ground-borne noise levels would increase until the roadheader is directly below the receiver. As tunnelling activities move away from the receiver ground-borne noise levels experienced would be lower.

Further information on feasible and reasonable construction noise and vibration mitigation and management measures is provided in **Section 5.10.11** of this report and in Section 12.5 of the EIS.

Further consideration of potential for vibration impacts, including potential for cumulative impacts from concurrent surface works and tunnelling works, would be carried out during the detailed design stage. This would include consideration of construction work scheduling to avoid cumulative impacts.

Issue Description – potential ground-borne noise and vibration impacts – NCA 26

A submission sought further information regarding potential vibration impacts at a property on Staples Street at Kingsgrove.

Response

The maps in Appendix J and Appendix K of the Technical working paper: Noise and vibration (Appendix J of the EIS) show the predicted construction ground-borne noise and ground-borne vibration impacts to receivers within NCA 26, including receivers along Staples Street.

Receivers at the northern end of Staples Street could be temporarily affected by ground-borne noise generated during tunnelling activities, when vibration from tunnel construction travels through the ground as vibration and 'breaks out' into buildings on the surface in the form of audible noise. Ground-borne noise levels would exceed the criteria by up to 10 dB(A) for the most affected receivers.

Ground-borne vibration levels would exceed the criteria for human comfort by up to 0.04 mm/s. These impacts would only occur for a period of around five days as tunnelling progresses beneath residential receivers in NCA 26.

Management measures would be implemented to avoid, minimise and / or manage potential impacts. Where exceedances of construction noise management levels for ground-borne noise are expected both within and outside standard construction work hours, the ICNG recommends strategies for noise mitigation and control. A construction noise and vibration management plan would be developed and implemented and would identify the receiver specific mitigation and management measures to be implemented. In selecting specific management measures, the Construction Noise and Vibration Management Plan would take into account the number and sensitivity of potentially affected receivers, the nature and duration of relevant construction activities, and the availability of additional feasible and reasonable management measures.

To minimise potential vibration impacts, the following management measures would be implemented:

- The safe working distances would be complied with where feasible and reasonable. This would include the consideration of smaller equipment when working close to existing structures
- If vibration intensive works are required within the safe working distances, vibration monitoring or attended vibration trials would be undertaken at the outset of these works to ensure that levels are within relevant criteria
- Building condition surveys of potentially affected structures would be completed both before and after the works to identify existing damage and any damage due to the works
- Vibration intensive construction works would be confined to the less sensitive daytime period (9.00am to 12.00pm and 2.00pm to 5.00pm) as far as reasonably practicable
- A detailed ground-borne noise assessment would be undertaken following further geotechnical investigations. This would include developing the vibration site law for the project.

Issue Description – vibration impacts on sensitive receivers from tunnelling activities

Submissions sought clarification of why vibration from tunnelling works is limited to certain locations as shown on the figures in Appendix K to the Technical working paper: Noise and vibration (Appendix J of the EIS).

Response

Maps provided in Appendix K of the Technical working paper: Noise and vibration (Appendix J of the EIS) show areas at the surface where vibration criteria are anticipated to be exceeded. Exceedances are shown in several isolated areas, and these are generally the result of:

- The depth of tunnelling activities. The maps of vibration criteria exceedances show a concentration of impacts around tunnel portal locations, where the tunnel comes to the surface. The tunnel depth reduces as the portal approaches
- Local geology. The maps of vibration criteria exceedances show an areas of impact through the Bardwell Valley Golf Course, as a result of depth of cover and local geological conditions
- The nature of construction activities. The maps of vibration criteria exceedances show small areas of impacts above tunnel cross passage construction activities.

An assessment of vibration from tunnelling works is provided in Section 12.4.1 of the EIS. This assessment identified that a total of around 163 receiver locations are anticipated to experience temporary vibration above the preferred vibration dose value during the night time, with no exceedances of the maximum vibration dose value. The assessment relates to human comfort. The structural damage criteria would not be exceeded by the tunnelling activities.

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 receiver.

Issue description – noise and vibration impacts at Arncliffe Public School

A submitter raised concerns that construction noise, including heavy machinery and vehicles operating close to the school, and vibrations during tunnel construction would impact on Arncliffe Public School.

Response

The Arncliffe Public School is outside of the study area for the noise and vibration assessment presented in the EIS. The school is outside the area anticipated to experience significant changes in noise levels as a result of the project.

Appendix K of the Technical working paper: Noise and vibration (Appendix J of the EIS) includes maps showing areas that may be affected by vibration during construction of the project. The maps indicate that the project would not have vibration impacts on the Arncliffe Public School.

5.10.4 Vibration from surface works during construction

663 submitters have raised issues regarding vibration in relation to surface works.

Issue description – vibration impacts on sensitive receivers from surface works

General concerns were raised regarding the impact of construction vibration on sensitive receivers. Submissions also requested additional information regarding the likely impacts to buildings and building occupants due to construction vibration from surface works and the management and management measures that would be implemented.

Response

The potential for vibration impacts from surface works is assessed in Section 12.4.1 and Appendix J (Technical working paper: Noise and vibration) of the EIS. Safe working distances from certain plant and equipment are provided in Table 12-11 of the EIS.

Based on expected plant and equipment to be used during surface works (refer to the list of plant items in Table 12-11 of the EIS), the key vibration generating equipment are expected to be a vibratory roller and a hydraulic hammer to conduct road works. This equipment has the potential to exceed:

- The human response vibration criterion within up to 100 metres (vibratory roller) and 73 metres (large hydraulic hammer)
- The structural cosmetic damage criterion within up to 25 metres (vibratory roller) and 22 metres (large hydraulic hammer).

Safe working distances could be encroached in proximity to residential receivers. The greatest potential for encroachment into safe working distances relates to vibration impacts on human comfort, in situations where vibration intensive equipment is used in proximity to residential receivers. Locations where this combination may occur include:

- The Kingsgrove North construction compound (C1), where it would be located adjacent to residences along its northern boundary
- The Bexley Road North construction compound (C4), where it would be located adjacent to residences along its western boundary

- The Bexley Road East construction compound (C6), where it would be located adjacent to residences along its northern boundary
- In some parts of the local road upgrades, where road upgrade works would be adjacent to residences.

In practice, vibration impacts from most construction activities would be intermittent during construction. The primary form of mitigation of vibration would be ensuring vibration intensive works do not occur within identified safe working distances.

However, where work within these safe working distances cannot be avoided, opportunities to use alternative equipment would be identified where feasible and reasonable and vibration monitoring would be implemented.

For works which would be required within the safe working distance for cosmetic damage the following would occur as a minimum:

- Notification of the works to the affected receivers
- Works would not proceed until attended vibration measurements are undertaken
- If ongoing works are required a permanent vibration monitoring system would be installed, to warn operators (via flashing light, audible alarm, short message service (SMS) etc.) when vibration levels are approaching the cosmetic damage limits.

Additionally, existing condition surveys would be offered to property owners on properties and structures within the project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works.

These existing condition surveys would be used to establish the existing condition of potentially affected structures. While best efforts would be made to minimise the risk of damage, and it is expected that only minor cosmetic damage would occur in worst cases, repairs would be made for any damage resulting from construction of the project.

5.10.5 Impacts from blasting

254 submitters have raised issues regarding the use of blasting as part of tunnel construction.

Issue description – ground blasting impacts during construction on residents and property

Submissions have raised concerns and queries regarding blasting, including:

- Confirmation of the likely impacts to property and residents given the duration of the project and ongoing future development
- Concern that, even though there are many assurances about control and precedent, blasting rather than mechanical excavation is more risky and uncontrolled than tunnelling by mechanical excavation. The use of blasting appears to have been prioritised for speed and shorter bursts of impact reasons.

Response

Excavation using road headers in combination with drill and blast has been assessed as being the most efficient means to construct the project tunnels having regard to geology, project program and cost efficiency, as well as an aim to limit as far as feasible and reasonable potential impacts from ground-borne noise and vibration to receivers at the surface.

Vibration impacts resulting from blasting would be dependent on the blast methodology, the size of the charges, spaces between charges, geology and timing between charges. A specialist blast consultant would be used to design blasts to ensure the lowest necessary maximum instantaneous charge (MIC) to achieve tunnel construction in a safe manner, while minimising potential impacts at the surface. This would include undertaking test blasts in new areas of tunnel construction activity.

Further detailed assessment and the blast trial process would be described in the Blast Management Strategy, prepared during the detailed design as part of the Construction Environmental Management Plan.

The potential impacts as a result of blasting associated with the construction of the project are assessed in Section 12.4.1 and Appendix J (Technical working paper: Noise and vibration) of the EIS. The assessment references the most recent relevant vibration damage criteria, Australian Standard *AS 2187: Part 2-2006 Explosives - Storage and Use - Part 2: Use of Explosives.* The AS 2187 criteria are presented in Table 25 of the Technical working paper: Noise and vibration (Appendix J of the EIS).

Further investigations into predicted noise and vibration levels would be undertaken following confirmation of the scope of blasting. Where levels are predicted to exceed the criteria, alternative methods (e.g. electronic detonation blasting and penetrating cone fracture) and quantities of material to be used in blasting would be reviewed during detailed design to ensure impacts are minimised.

Feasible and reasonable management measures to manage potential impacts from blasting have been identified and are described in Section 12.5.3 of the EIS. These would include:

- Noise and vibration management methods specific to blasting would be incorporated into the construction noise and vibration management plans where required
- Blasting with the potential to generate an impact at the surface would be restricted to standard daytime hours (except where approved by the relevant authority)
- Blasting would occur between 9.00am and 5.00pm, up to five days per week (Monday to Friday) and on Saturdays (9.00am to 1.00pm). Blasts would be limited to one single detonation in any one day per receiver group, unless otherwise agreed by the NSW EPA through consultation on the Construction Noise and Vibration Management Plan
- Site investigations would be conducted prior to production blasting to define suitable blast sizes to comply with project blasting noise and vibration criteria
- Condition surveys of nearby receiver buildings would be undertaken where the potential for exceedances of the blasting criteria is identified
- Where the predicted levels exceed the noise or vibration criteria for blasting, alternative construction methods, such as penetrating cone fracture, would be utilised
- Community consultation for sensitive receivers likely to be impacted by construction activities such as blasting, vibration and noise would be carried out.

Issue description – higher vibration criterion for blasting events

Submissions requested further information on what a 'short period of time' is in relation to permitting higher vibration criterion to be adopted during blasting. Submissions recommended that given the range of sensitivities to vibration within any one community, it would be more appropriate to apply a conservative measure in the first instance.

Response

The blast vibration criteria presented in *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990), which have been applied to the assessment of potential blasting impacts from the project, are conservative and were developed to protect communities exposed to long-term blasting operations. Long-term blasting occurs in developments such as coal mines, where blasting activities can be required over decades.

In comparison, blasting which would be undertaken for construction of the project would not be long-term and would occur over a shorter time period (tunnelling is expected to commence in early 2017 and conclude in mid-2019 – a period of around 2.5 years). Blasting would not be undertaken in a single or centralised area for any extended period of time. Instead, blasting would take place along the tunnel alignment (over around nine kilometres), which would mean that any one receiver would be affected for a small proportion of the overall project program.

5.10.6 Construction traffic noise

22 submitters have raised issues regarding traffic noise during construction.

Issue description – 24 hour construction traffic

Submissions 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 trucks travelling along roads through the night, which would disturb the sleep of local residents already stressed by the WestConnex project.

Response

In most instances, increases in traffic noise as a result of project construction traffic would be less than 2 dB(A), which would meet the applicable target criterion in accordance with the *NSW Road Noise Policy* (RNP) (DECCW, 2011). Situations where traffic noise increases are anticipated to exceed this 2 dB(A) criterion as a result of the project include:

- For residential receivers in Wirega Avenue and West Botany Street (north of the M5 East Motorway)
- During the AM off-peak periods along construction haulage routes in the Kingsgrove and St Peters areas
- During the quietest periods of the night-time around all of the construction compounds where 24 hour construction activities would occur.

As far as feasible and reasonable, spoil haulage from construction compounds during the evening and night-time periods would be confined to arterial roads.

Undertaking tunnelling 24 hours per day benefits the local community by minimising the overall length of construction and the duration of any associated amenity impacts. Spoil haulage is therefore required 24 hours per day, seven days per week.

Further, stockpiling of spoil with no spoil haulage outside of standard hours would result in a greater number of spoil haulage vehicle movements during standard hours. This would have an adverse effect on the performance of the road network, particularly in peak hours. In addition, spoil stockpiles would have required that the tunnelling sites be significantly larger so as to accommodate the anticipated quantities of spoil material. This would have resulted in an increase in the number of properties acquired for the project.

Spoil haulage from the following tunnelling sites (as outlined in Table 6-26 of the EIS) is required to occur 24 hours per day to support tunnelling activities:

- Kingsgrove North (C1) construction compound
- Commercial Road (C3) construction compound
- Bexley Road North (C4) construction compound
- Bexley Road South (C5) construction compound
- Bexley Road East (C6) construction compound
- Arncliffe (C7) construction compound
- Canal Road (C8) construction compound.

Concrete and shotcrete deliveries to these construction compounds 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.

At all tunnelling support sites, stockpiling and spoil handling would occur within specially designed sheds, reducing potential noise impacts. Doors of these sheds would be kept closed during the night-time where feasible and reasonable to minimise potential noise impacts. Further, the layouts of the sites would be designed so as to maximise distance and shielding to nearby receivers as far as practicable.

Because the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009) does not provide specific guidance in relation to acceptable noise levels associated with construction traffic, the noise increase criterion described in the RNP (ie 2 dB(A)) has been adopted for assessment of the project. Under the RNP, an increase of up to 2 dB(A) is a minor impact that is considered barely perceptible to the average person. Where the road traffic noise levels are predicted to exceed 2 dB(A) as a result of construction traffic noise from traffic associated with the project, feasible and reasonable noise management measures would be considered to reduce potential noise impacts and preserve acoustic amenity.

Specific feasible and reasonable management measures would be investigated during detailed design. This may include using management measures proposed for the operational noise assessment.

An assessment of construction road traffic noise is included in Section 12.4.1 and the Technical working paper: Noise and vibration (Appendix J of the EIS). Construction traffic noise has been assessed during the AM and PM peak and non-peak periods, including a PM off-peak hour, being the lowest non-peak traffic hour between 7.00pm and 6.30am.

Table 5-9 summarises for the PM off-peak hour:

- Existing traffic volumes (without the project) forecast in 2016 (the anticipated year of commencement of construction of the project)
- The expected construction traffic generated by the project
- The calculated increase in road traffic noise along construction traffic routes (resulting from project construction traffic).

The calculated increase in road traffic noise attributable to the project has been analysed, and anticipated increases of 2 dB(A) $L_{Aeq(1hour)}$ have been highlighted in the table.

Table 5-9 Construction road traffic noise increases during the PM off-peak period

Route / direction	Existing traffic (2016)		Project construction traffic		Relative noise increase from project construction traffic ($L_{Aeq(1hour)}$) (dB(A))
	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	
Western surface works area					
Wirega Avenue	39	6	52	102	10.5
Moorefield Road, west of Wirega Avenue	137	7	52	102	7.7
M5 East Motorway, west of the Kingsgrove North construction compound (C1)	439	61	52	102	2.7
M5 East Motorway, east of the Kingsgrove North construction compound (C1)	439	61	52	102	2.7
Kingsgrove Road, north of the M5 East Motorway	54	13	52	102	8.4
Moorefield Road, east of Wirega Avenue	165	8	52	102	7.1
Commercial Road	114	4	52	102	8.7
Kingsgrove Road, south of the M5 East Motorway	47	4	52	102	11.2
M5 East Motorway, east of Kingsgrove Road	439	61	52	102	2.7
Bexley Road surface works area					
Bexley Road, between the M5 East Motorway and the motorway on-ramp	60	7	20	36	6.0
M5 East Motorway, west of Bexley Road	508	146	20	36	0.7
M5 East Motorway, west of King Georges Road	439	61	20	36	1.2
Canterbury Road, between King Georges Road and Bexley Road	207	22	20	36	2.7
Bexley Road, north of the M5 East Motorway	62	6	20	36	6.0
Bexley Road, south of the M5 East Motorway	60	7	20	36	6.0
Stoney Creek Road	96	21	20	36	3.5
Arncliffe surface works area					
Marsh Street, north of Innesdale Road	201	36	15	38	2.2
Marsh Street, between Innesdale Road and Valda Avenue	187	35	15	38	2.3
Marsh Street, between the M5 East Motorway and West Botany Street	139	34	15	38	2.5
West Botany Street, north of the M5 East Motorway	111	18	15	38	3.6
West Botany Street, south of the M5 East Motorway	243	19	15	38	2.7
Wickham Street	140	20	15	38	3.3
Princes Highway, south of Forest Road	250	20	15	38	2.4
St Peters interchange and local road upgrades surface works area					
Princes Highway, north of Campbell Road	233	23	120	83	4.8

Route / direction	Existing traffic (2016)		Project construction traffic		Relative noise increase from project construction traffic ($L_{Aeq(1hour)}$) (dB(A))
	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	
Campbell Road, west of the Canal Road construction compound (C8)	59	3	120	83	10.9
Campbell Road, east of the Canal Road construction compound (C8)	61	7	120	83	9.1
Burrows Road, northern end	50	10	120	83	8.7
Burrows Road, southern end	48	2	120	83	12.1
Canal Road	234	24	120	83	4.7
Princes Highway, south of Canal Road	394	37	120	83	3.5
Princes Highway, between Campbell Road and Canal Road	266	26	120	83	4.4

Issue description – unassessed traffic routes

Submissions have raised concerns with the following statement in the EIS: 'However, construction vehicles may use local roads that do not form part of the construction compound vehicle routes to access construction areas (such as along local roads that are subject to construction activities). However, these would not constitute major haulage routes.'

This statement indicates there are a number of unassessed construction traffic routes and impacts that haven't been included in the EIS. The Technical working paper: Noise and vibration (Appendix J) does not provide any insight to this as referenced in the EIS. Submissions questioned why all routes have not been included and assessed as required by the Secretary's Environmental Assessment Requirements (SEARs). All other routes not included in the EIS should be banned during construction.

Response

The construction haulage routes presented in the EIS are intended to be used for all construction traffic generated by the project, and were assessed on that basis. However, there is potential that short term alternative routes may need to be considered on an ad-hoc basis as a result of incidents and emergency situations (including road blockages or closures outside the direct control of the project) or to accommodate restrictions associated with construction programming (for example, staging of activities in and around construction sites). There may also be opportunities for minor changes to traffic circulation patterns as a traffic and noise impact mitigation approach, to provide periods of respite to affected receivers.

If the project is approved, a Construction Traffic Management and Safety Plan would be prepared as part of the Construction Environmental Management Plan; in accordance with the relevant conditions of approval. This plan would be developed in consultation with relevant councils, emergency services, road user groups and pedestrian and cyclist user groups and would, in tandem with the Construction Noise and Vibration Management Plan, detail the specific mitigation and management measures which would be employed to minimise construction traffic and noise impacts to sensitive receivers as far as feasible and reasonable. These plans would require approval by DP&E.

Section 11.4 of Appendix I of the EIS identifies measures to manage construction traffic noise impacts. These measures would be confirmed during detailed design, and include:

- Truck drivers would be advised of designated vehicle routes, parking and queuing locations, acceptable delivery hours and other relevant practices (i.e. minimising the use of engine brakes, and no extended periods of engine idling)
- Deliveries and spoil removal would be planned to avoid queuing of trucks around construction ancillary facilities
- As far as practicable, construction vehicle movements along local roads at night would be restricted to light vehicles only, subject to further investigation of potential night-time maximum noise levels during detailed design
- As far as practicable, heavy vehicle movements outside standard construction hours associated with tunnel support works (spoil removal, concrete delivery and other heavy vehicle movements) would be limited to access and egress directly to and from the arterial road network
- Induction and training would be provided to relevant staff and subcontractors outlining their responsibilities with regard to noise.

Issue description – unassessed traffic routes at St Peters

Concerns were raised that the EIS does not have a measurement of the impact of construction traffic traveling along roads north of the St Peters interchange site, including along Euston Road or Mitchell Road at St Peters.

Response

Major construction traffic routes to and from construction compounds are shown in Chapter 9 (Traffic and transport) and Appendix G (Technical working paper: Traffic and transport) in the EIS. Major construction traffic routes are those roads that would be used for the haulage of spoil, construction materials and plant and equipment. Major construction traffic routes around the St Peters interchange construction site are shown in Figure 9-18, Figure 9-19 and Figure 9-20 in the EIS and include Canal Road, Burrows Road, Campbell Road / Campbell Street and the Princes Highway. Assessment of construction traffic noise along these roads is presented in Section 5.4 of Technical Working Paper: Noise and vibration (Appendix J of the EIS).

Neither Euston Road nor Mitchell Road at St Peters is a major construction route. Notwithstanding, construction traffic would access Euston Road during local road upgrade works, including widening of Euston Road. Although this traffic has not been considered separately as part of the construction traffic noise assessment, noise contributions from heavy vehicles accessing Euston Road during local road upgrade works were included in the site-based construction noise assessment. Table 34 in Technical Working Paper: Noise and vibration (Appendix J of the EIS) lists the plant and equipment that has been included in the construction noise assessment, and in the case of local road upgrades (including along Euston Road), this includes heavy vehicles (listed as truck and dogs) for several construction activities.

Heavy vehicle traffic generated during the construction of the project is not anticipated to use Mitchell Road.

Issue description – unassessed traffic routes at Kingsgrove

Construction vehicle movements along local roads around the Bexley Road East construction compound have not been assessed in detail.

Response

Major construction haulage routes around the western surface works area, including the Bexley Road East construction compound (C6) are shown in Figure 9-10 to Figure 9-20 of the EIS. Major construction traffic routes are those roads that would be used for the haulage of spoil, construction materials and plant and equipment.

Traffic generated by the Bexley Road East construction compound (C6) in isolation would include around 16 light vehicles per day. Because the compound would not generate heavy vehicle traffic, and would not generate significant volumes of traffic, a separate assessment of traffic noise impacts from activities at this compound is not warranted.

Issue description – general construction traffic concerns

Noise impacts from construction vehicles including heavy trucks in residential streets.

Response

Section 12.4.1 of the EIS presents predicted traffic noise increases on roads affected by project construction traffic.

Because the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009) does not provide specific guidance in relation to acceptable noise levels associated with construction traffic, the noise increase criterion described in the RNP (ie 2 dB(A)) has been adopted for assessment of the project. Under the RNP, an increase of up to 2 dB(A) is a minor impact that is considered barely perceptible to the average person. Where the road traffic noise levels are predicted to exceed 2 dB(A) as a result of construction traffic noise from traffic associated with the project, feasible and reasonable noise management measures would be considered to reduce potential noise impacts and preserve acoustic amenity.

Predicted project construction traffic noise levels are summarised in Table 12-42 to Table 12-45 of the EIS for heavy vehicles and light vehicles. The calculated increase in road traffic noise attributable to the project has been analysed, and anticipated increases of 2 dB(A) have been highlighted in the tables.

In most instances, increases in traffic noise as a result of project construction traffic would be less than 2 dB(A), which would meet the applicable target criterion in accordance with the *NSW Road Noise Policy* (RNP) (DECCW, 2011). Situations where traffic noise increases are anticipated to exceed this 2 dB(A) criterion as a result of the project include:

- For residential receivers in Wirega Avenua and West Botany Street (north of the M5 East Motorway)
- During the AM off-peak periods along construction haulage routes in the Kingsgrove and St Peters areas
- During the quietest periods of the night-time around all of the construction compounds where 24-hour construction activities would occur.

As far as feasible and reasonable, spoil haulage from construction compounds during the evening and night-time would be confined to arterial roads. However, some construction compounds would be accessed via local roads.

Section 12.5 of the EIS identifies measures to manage construction traffic noise impacts. These measures would be confirmed during detailed design, and include:

- Truck drivers would be advised of designated vehicle routes, parking and queuing locations, acceptable delivery hours and other relevant practices (i.e. minimising the use of engine brakes, and no extended periods of engine idling)
- Deliveries and spoil removal would be planned to avoid queuing of trucks around construction ancillary facilities
- As far as practicable, construction vehicle movements along local roads at night would be restricted to light vehicles only, subject to further investigation of potential night-time maximum noise levels during detailed design
- As far as practicable, heavy vehicle movements outside standard construction hours associated with tunnel support works (spoil removal, concrete delivery and other heavy vehicle movements) would be limited to access and egress directly to and from the arterial road network
- Spoil removal would be minimised between 10.00pm and 7.00am
- Induction and training would be provided to relevant staff and subcontractors outlining their responsibilities with regard to noise.

Issue description – construction traffic concerns at Kingsgrove

Submissions have raised concerns relating to construction traffic noise around Glamis Street at Kingsgrove. Submissions objected to the use of Garema Circuit for up to 24 hours a day to haul large volumes of soil from the tunnel construction point. Due to the proximity to private housing on the western side of the street, the noise impacts on local residents would be unacceptable.

Submissions recommended that due to the proximity of private housing on the western side of Garema Circuit (compared to commercial / industrial buildings on the eastern side) noise impacts to residents on the western side could be significantly reduced by realigning construction traffic to the eastern side.

Response

In response to submissions and as part of ongoing design development, investigations are underway into the feasibility of implementing a left in and right out arrangement for heavy vehicles moving to and from the Kingsgrove North construction compound (C1). This would result in the eastern side of Garema Circuit being utilised for heavy vehicles only which would assist in minimising potential noise impacts from construction traffic to nearby residential receivers.

This traffic arrangement would be considered further and confirmed during detail design, as described in new environmental management measure NV31 in **Chapter 8** (Revised summary of environmental management measures) of this report).

Potential traffic noise impacts to sensitive receivers along this route have been assessed as part of noise catchment area 19 (NCA 19). Construction traffic using this route would generally comply with applicable traffic noise assessment criteria. However there may be some exceedances for receivers along Wirega Avenue during periods of the day. In all other areas of NCA 19, potential exceedances are only anticipated during the quietest times of the evening.

Table 81 to Table 84 in the Technical working paper: Noise and vibration (Appendix J of the EIS) present the predicted relative traffic noise increases along this route for the AM and PM peak and non-peak periods respectively.

To assist in alleviating traffic through Garema Circuit, direct access to and from the Kingsgrove North construction compound and the M5 East Motorway would also be provided.

In addition to the design change currently under consideration (ie the feasibility of implementing a left in and right out arrangement for heavy vehicles moving to and from the Kingsgrove North construction compound (C1)), feasible and reasonable management strategies would be investigated to minimise the volume of heavy vehicle movements along this route at night. These would be detailed in the Construction Noise and Vibration Management Plan.

Further discussion on the potential traffic and transport impacts associated with the use of this route is provided in **Section 5.8.2** of this report.

5.10.7 Construction noise from out-of-hours work

1,594 submitters have raised issues regarding noise from construction works outside standard construction hours.

Issue description – general concerns regarding 24-hour construction work

Submissions have raised concern that construction of the project would result in unacceptable noise impacts on residents, including disruption to sleep due to the 24-hour construction work and the associated construction noise and vibration impacts.

Submissions stated that these impacts were unjustified, and would be an unreasonable burden to place on the community given the number of highly noise affected receivers who would be impacted during out-of-hours works. Submissions also contended that noise from out-of-hours work should not be allowed where local by-laws restrict noise levels after 10.00pm and before 6.00am, and that the same curfew that is applied to aircraft noise should be applied to construction.

Response

Table 6-26 in the EIS summarised construction hours, including anticipated construction activities that would need to be conducted outside standard construction hours. Construction hours for each construction compound are also presented in Table 6-27.

Some construction activities outside standard construction hours are unavoidable based on:

- Public and construction worker safety
- Design and quality considerations
- Minimisation of the length of construction and the duration of associated impacts on the local community
- Avoidance of significant traffic interruptions along the M5 East Motorway and the surrounding arterial and local road network.

Within these broad requirements, construction activities conducted outside standard construction hours have been minimised. In developing construction methodologies and a 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. Opportunities to further reduce construction timeframes while protecting local amenity would be considered during detailed design and construction planning in consultation with key stakeholders and the community.

Chapter 12 (Noise and vibration) and Appendix J (Noise and vibration) of the EIS include a detailed assessment of noise impacts generated by construction activities conducted outside standard construction hours. Table 12-30 to Table 12-40 in the EIS summarise the outcomes of this assessment, including the number of receivers anticipated to experience noise above:

- Noise management levels for activities outside standard construction hours
- The noise level at which a receiver would be characterised as highly noise affected
- Sleep disturbance thresholds.

The most significant construction activities to be conducted outside standard construction hours with respect to the level and extent of impact include local road upgrades, roadworks associated with the construction of tolling infrastructure, and piling works.

These noise modelling results presented in the EIS for construction activities outside standard construction hours do not necessarily represent the noise impact at noise sensitive receivers for an extended period of time. For example, particularly noisy activities such as rock hammering and the use of concrete saws are likely to persist for only a small proportion of the overall construction period. Additionally, the construction noise predictions use the shortest separation distance to each sensitive receiver. This is a conservative assumption and would tend to overestimate noise emissions from construction activities being carried out further away from sensitive receivers.

In most cases, construction sites for the project would be subject to different construction activities during different times in the construction program. This means that peak construction impacts would not be experienced for the entire expected duration of construction works. Section 6.2 of the EIS provides further details of the specific activities and expected duration of construction works at each construction ancillary facility.

To minimise the overall length of construction and the duration of amenity impacts on the local community, tunnelling works are proposed to be carried out 24 hours per day, seven days per week. Tunnelling support activities are therefore required outside of standard construction hours to support continuous tunnelling. This would include heavy vehicle movements to and from the five tunnel construction sites.

Tunnelling works outside of standard construction hours would occur within a shed. The acoustic rating of the shed would be determined by the requirements managed through the Noise and Vibration Management Plan.

Feasible and reasonable management measures which would be considered during the construction of the project could include:

- Construction site noise would be managed via consideration of the layout of construction compound sites to maximise distance and shielding to nearby receivers
- Appropriate plant and equipment would be selected for each task to minimise noise contributions
- Where feasible and reasonable, alternative work methods such as the use of hydraulic or electric-controlled units in place of diesel units would be consisted and implemented
- The use of alternative machines that perform the same function (such as rubber wheeler plant) would be considered in place of steel tracked plant, and noisy equipment would be orientated away from residential receivers where feasible and reasonable
- Where practicable, consideration would be given to permanent noise barriers being scheduled for completion as early as possible to assist in mitigating construction noise
- Where feasible and reasonable the use of temporary noise walls or hoarding would be investigated where works or compounds are in proximity to residential receivers
- Noise monitoring would be implemented to assist in confirming and controlling the site-specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress.

Where exceedances of construction noise management levels are expected both within and outside standard construction work hours, the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009) recommends strategies for noise mitigation and control. A construction noise and vibration management plan would be developed and implemented and would identify the receiver specific mitigation and management measures to be implemented. In selecting specific management measures, the Construction Noise and Vibration Management Plan would take into account the number and sensitivity of potentially affected receivers, the nature and duration of relevant construction activities, and the availability of additional feasible and reasonable management measures.

Additional construction noise mitigation and management measures could include:

- Letterbox drop – notification of construction activities as part of periodic community updates distributed across areas surrounding construction activities
- Noise verification – receiver or catchment specific noise verification used to confirm the construction noise performance of the project and to proactively inform, where relevant, review and update noise mitigation and management measures, and site construction practices
- Individual briefing – offers of individual briefings about relevant construction activities and potential impacts with potentially affected receivers
- Receiver specific notifications – individual correspondence to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Receiver specific contact – individual phone calls, emails or visits to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Respite periods – programming of feasible and reasonable respite periods for potentially affected receivers
- Alternative accommodation – offers of reasonable alternative accommodation for receivers potentially affected by construction activities conducted at night (from 10.00pm to 7.00am). Alternative accommodation would be subject to consultation with the affected receiver and would take into account the duration and intensity of the potential impact.

Ongoing noise monitoring would be undertaken during construction at sensitive receivers during critical periods to identify and assist in managing high risk noise events.

Issue description – out-of-hours construction works during site establishment

Page 12-60 of the EIS states that '…no activities would occur outside of standard construction hours during site establishment.' However pages 12-61 of the EIS states that there would be out-of-hours site establishment works for tunnelling works, with the assessment for this shown in Table 12-39 of the EIS. Table 12-39 of the EIS lists a number of activities under tunnelling site establishment that would not appear to be related to site establishment but to construction works themselves (i.e. piling and excavation). Given the numbers of receivers that would be exposed to noise with the potential for sleep disturbance during these out-of-hours works, there needs to be more justification given for why it is necessary to undertake these activities out-of-hours.

Response

As described in Section 6.7.2 of the EIS, tunnelling and tunnel support activities (including fitout works, but excluding blasting) would be undertaken 24 hours per day, seven days per week to minimise the overall length of construction and the duration of any associated amenity impacts on the local community.

Where the assessment indicates that relevant noise management levels are predicted to be exceeded, consideration is required to be given to feasible and reasonable mitigation and management measures. A number of construction noise management measures have been recommended and are presented in Section 7.0 of the Technical working paper: Noise and vibration (Appendix J of the EIS).

Opportunities for additional feasible and reasonable management measures to protect local amenity and reduce construction noise impacts would be considered during the detailed design process as part of the development of the Construction Noise and Vibration Management Plan.

Issue description – generator noise for security lighting during site establishment

The use of generators to run security lighting for the sites during site establishment is questionable particularly considering the number of locations where noise management levels (NMLs) are exceeded as a result and one receiver is subject to noise above the sleep disturbance assessment criterion in NCA 7. It would be understandable if this work was being undertaken in regional NSW but surely security lights can be run off mains power in Australia's largest city.

Response

There may be a period during the early stages of construction where the power requirements for security lighting would need to be provided through onsite diesel generators. For the majority of the construction period, however, the security lighting would be powered by mains power. Where generators are used and are required to operate outside standard construction hours, noise would be managed as per the requirements outlined in the Noise and Vibration Management Plan.

Issue description – sleep disturbance around St Peters and Alexandria

Submissions relating to out-of-hours works and sleep disturbance raised issues regarding these impacts around St Peters and Alexandria. Submissions stated that residents in these areas would have to endure excessive amounts of noise during the evening and night-time periods for an extended period of time. A high number of receivers would be highly noise affected and would be subject to exceedances of the sleep disturbance criteria.

Response

Exceedances of the sleep disturbance criteria around St Peters and Alexandria would result from the construction of the local road upgrades in this area. Details of the predicted exceedances are provided in Table 12-34 of the EIS.

These exceedances would be as a result of the need to construct these works outside of the standard daytime construction hours, due to the significant impact these works would otherwise have on the operability and safety of the road network during periods when the road network is at its busiest (ie during the day). To carry out these activities during standard construction hours would not be feasible from a road safety or traffic management perspective.

Many of the predicted sleep disturbance construction noise impacts would be relevant to only part of the anticipated complete construction program, and in most cases receivers would not be exposed to elevated noise levels for the entire construction period.

Construction noise and vibration management plan(s) would be developed and implemented. The plan(s) would identify specific management measures, taking into account the number and sensitivity of potentially affected receivers, the nature and duration of relevant construction activities, and the availability of feasible and reasonable management measures.

To mitigate and manage construction noise measures, a similar approach to that which has recently been applied to the NorthConnex, the Hills M2 Motorway Upgrade and the Sydney Metro Northwest projects would be followed, including:

- A review of the predicted construction noise impacts, including any refinements to the assessment presented in this EIS as a result of detailed design
- Identification of receiver specific mitigation and management measures depending on the level of predicted construction noise impact relative to rating background levels (RBLs).

An indication of the types of mitigation and management measures that would be developed and applied for affected receivers is presented in Table 12-49 of the EIS. Further, noise monitoring programs would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress.

5.10.8 Cumulative noise impacts during construction

72 submitters have raised issues regarding cumulative noise impacts during construction.

Issue description – cumulative noise impacts not assessed

Submissions have raised general concerns that the cumulative noise impacts from surface and underground tunnelling construction activities had not been assessed in the EIS. Submissions referenced specific developments:

- Sydney Metro City and Southwest
- Marrickville Metro shopping centre extension.

Response

Cumulative noise impacts resulting from multiple concurrent construction scenarios are assessed in Section 12.4.1 and Appendix J (Technical working paper: Noise and vibration) of the EIS. Further consideration of cumulative noise impacts from the project and other projects in the area is provided in the cumulative impact assessment in Section 27.5 of the EIS.

Overall, due to the anticipated staging and relative location of each project the potential for significant cumulative impacts would be low.

Consultation would occur between the relevant projects in relation to construction staging and haulage routes in order to minimise the potential for cumulative impacts.

The prediction of cumulative noise levels from more than one construction scenario operating close to another scenario within the project area is complex given the number of sources and the number of possible combinations of different construction scenarios. In practice, it is not always possible to specify the precise location of more than one works scenario for the same 15-minute period, and calculating the cumulative impacts based on all nearby works operating simultaneously on a worst-case basis would result in the assessment becoming overly conservative.

Since the works are anticipated to be of a similar nature, the effect of concurrent construction works is likely only to increase the number of 15-minute periods during construction when the predicted worst case noise impacts would be apparent. In other words, concurrent construction works would be more likely to extend the duration of elevated noise levels, rather than increase the magnitude of predicted maximum construction noise impacts.

Construction scenarios with the potential to generate cumulative impacts include activities at construction ancillary facilities and tunnelling sites. These facilities would include predominantly stationary noise sources which would operate on a day-to-day basis. The worst case impacts on the most potentially affected receivers from the combination of construction ancillary facilities and tunnelling sites operating concurrently are not anticipated to increase significantly beyond the individual scenario impacts. Cumulative noise impacts generated by concurrent operation of construction ancillary facilities and tunnel sites on the worst case construction noise levels are therefore concluded to be minor.

Issue description – cumulative noise impacts with M4 East

Concerns were raised regarding the cumulative impact of construction traffic noise from the New M5 and the M4 East construction.

Response

Cumulative noise impacts resulting from multiple concurrent construction scenarios is assessed in Section 12.4.1 and Appendix J (Technical working paper: Noise and vibration) of the EIS.

The M4 East project would be carried out at a significant distance from the New M5. There is unlikely to be any cumulative noise impact between the two projects, including in relation to noise generated by construction traffic.

Issue description – cumulative noise impacts with local developments

Concerns were raised regarding the cumulative impact of construction traffic noise from the Euston Road widening with development of Ashmore Estate, specifically around Lawrence Street and Belmont Street at Alexandria.

Submissions stated that it would be difficult to 'coordinate mitigation and management of construction noise from concurrent construction activities based on the programmed works' as stated in the EIS. Background noise levels are currently relatively low such that a jackhammer can be heard several kilometres away at night.

Response

The Ashmore Estate redevelopment is in the planning assessment stage and construction has not commenced. The timing of the commencement of these works is not known. Cumulative noise impacts for the New M5 project and this project have therefore not been assessed.

The potential for cumulative noise impacts would be managed through the preparation and implementation of a Construction Noise and Vibration Plan, which would take into account the need for scheduling activities to minimise or avoid cumulative noise impacts, where feasible and reasonable. The plan would also detail site and receiver specific noise mitigation and management measures consistent with the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009).

5.10.9 Property damage and existing condition surveys

510 submitters have raised issues in regard to property damage during construction and also the need for property existing surveys.

Issue description – general property damage concerns from construction

Submissions expressed concern that the construction of the project could damage buildings due to both surface and tunnelling works. The following queries were made:

- General concerns were raised that a large number of properties would be susceptible to cosmetic damage.
- Requests for information regarding the measures to manage potential property damage were also received
- Recommendations that the extent of the area in which buildings would be eligible for existing condition surveys be expanded
- Concerns that tunnelling would cause damage to old homes and / or homes which are constructed / partially constructed of asbestos
- Concerns that construction timelines have been prioritised ahead of avoiding damage to residents homes
- Concerns that tunnelling would be undertaken too close to the surface
- Concern that construction works and the future addition of up to 60,000 additional vehicles along Euston Road would cause further damage to properties, following on from damage which it is claimed occurred to these properties while Bunnings was being constructed.

Response

The EIS provides an assessment of construction noise and vibration in Section 12.4.1 Appendix J (Technical working paper: Noise and vibration), including consideration of potential ground-borne noise and vibration impacts from tunnelling activities. This assessment has been carried out in accordance with the SEARs and relevant guidelines including the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009).

The assessment determined that vibration levels would not exceed the applicable structural damage criteria, including for heritage items. The assessment of construction vibration impacts from tunnelling works found that the preferred levels for human comfort may be exceeded at a number of receivers at night-time. However, the maximum level for human comfort would not be exceeded.

Receivers at the surface would generally experience vibration for up to five days at each affected receiver with exceedances occurring for up to two days. As the tunnelling progresses, vibration impacts to receivers at the surface would lessen.

Vibration impacts on properties due to tunnelling activities are discussed further in **Section 5.10.3** of this report.

Vibration-based safe working distances from certain plant and equipment are in Table 12-11 of the EIS. Safe working distances for vibration intensive plant could be encroached in proximity to residential receivers. The greatest potential for encroachment into safe working distances relates to vibration impacts on human comfort, in situations where vibration intensive equipment is used in proximity to residential receivers.

The primary form of mitigating vibration would be ensuring vibration intensive works do not occur within identified safe working distances. Where work within these safe working distances cannot be avoided, opportunities to use alternative equipment would be identified where feasible and reasonable and vibration monitoring would be implemented.

For works which would be required within the safe working distance for cosmetic damage the following would occur as a minimum:

- Notification of the works to the affected receivers
- Works would not proceed until attended vibration measurements are undertaken
- If ongoing works are required a permanent vibration monitoring system would be installed, to warn operators (via flashing light, audible alarm, short message service (SMS) etc.) when vibration levels are approaching the cosmetic damage limits.

In developing construction methodologies and a 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. Opportunities to further reduce construction timeframes while protecting local amenity would be considered during detailed design and construction planning.

Before the start of tunnelling or other vibration intensive works at each site, condition surveys would be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works.

Where damage is shown to have occurred due to the project, consultation would be undertaken with the affected landowner to determine the rehabilitation requirements in order restore the property to its pre-construction condition. All works would be undertaken at no cost to the affected property owner.

Issue description – general property damage concerns from operation of the tunnel

Submissions have raised concerns that the operation of the tunnel could result in property damage impacts to receivers at the surface.

Response

Vehicles using the project tunnels during operation would not generate vibration transmitted through the tunnel and overlying rock at levels likely to lead to vibration or ground-borne impacts at the surface. This is because:

- Vehicles would generate relatively low intensity vibration, particularly relative to other project scenarios such as the use of road headers during construction tunnelling
- The road pavement wearing course 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. By comparison, the more vibration intensive use of road headers for construction tunnelling only result in elevated ground-borne noise levels around tunnel portals and shallower sections of the project tunnels (reflecting the effect of deep tunnel locations and attenuation through significant rock depths).

Issue description – general property damage concerns from operation of surface roads

Submissions have raised concerns that the operation of the surface roads (Euston Road) could result in property damage impacts to receivers from vibration.

Response

Vehicles using the upgraded surface roads around the St Peters interchange would not generate vibration at levels likely to lead to impacts to adjoining properties. This is because:

- Vehicles would generate relatively low intensity vibration
- The road pavement wearing course 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 a transmitting material and significant vibration attenuation would be provided by the atmosphere between the vehicle and surrounding receivers.

Issue description – existing condition surveys – eligibility

Submission requested that the scope of the existing condition surveys be expanded by up to 500 metres from the tunnelling works, as properties within this curtilage could experience some vibration and damage. Specific reference was made to:

- Vibrations from the tunnelling works to construct the train tunnel between Wolli Creek and the airport, where vibrations were felt at some buildings in Tempe up to 400 metres away
- The 50-metre rule for existing condition surveys being inadequate.

Response

Before the start of tunnelling or other vibration intensive works at each site, condition surveys would be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works.

Where damage is shown to have occurred due to the project, consultation would be undertaken with the affected landowner to determine rehabilitation requirements so as to restore the property to its pre-construction condition. This would occur at no cost to the property owner.

Based on the assessment of potential impacts and the depth of the tunnel in this location, there is no justification for extending this 50-metre zone. The assessment of ground-borne noise and vibration presented in the EIS demonstrates that impacts would not occur beyond the 50-metre zone.

Issue description – existing condition surveys – scope and timing

Submissions stated that the EIS did not provide sufficient timing or assessment details for property structural evaluation prior to project construction. Specific concerns included:

- Concerns about structural damage understood to have occurred on past tunnel projects
- Given there are ‘no Australian Standards to assess building damage caused by vibration,’ and that property inspection reports are suggested, there should be some assessment of probable impact before the project commencement, but does not specify a timeframe
- If the exact impacts cannot be known in advance, then a cautious and pro-active approach should be taken to minimise possible damage. Rather than 50 metres, properties within 100 metres of the proposed tunnelling should be contacted and inspected with thorough documentation as to their structural integrity at least three months prior to project commencement to enable adequate measures to be costed, implemented with the potential for damage minimised.

Response

An assessment of potential vibration impacts from surface and tunnelling works has been undertaken in accordance with the SEARs for the project and relevant guidelines and standards. The assessment has identified the potential, albeit it low, for structural damage resulting from vibration. Further information regarding the vibration assessment criteria is provided in Section 12.3.2 of the EIS and the outcomes of the assessment are provided in Section 12.4.1 of the EIS.

For assessing the potential for structural damage as a result of construction vibration, the adoption of the German Standard *Structural Vibration, Part 3: Effects of Vibration on structures (DIN 4150-3*) is consistent with other projects of a similar scale in Australia. The limits defined in the standard are recognised as precautionary and do not necessarily mean that damage to a structure would occur.

Before the commencement of tunnelling works, existing condition surveys would be carried out on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works. The assessment of ground-borne noise and vibration presented in the EIS demonstrates that impacts would not occur beyond the 50-metre zone.

In the event of damage caused by the construction of the New M5 project, this would be rectified at no cost to the property owner.

Issue description – existing condition surveys – Campbell Street terraces

Submissions requested that the Campbell Street terraces at 2 to 36 Campbell Road at St Peters be assessed for structural integrity and that a dilapidation report be completed. The premises are double brick frontage but single brick construction and have the potential to be significantly damaged during construction and also with the repeated vibration of the expected traffic flows. Mitigation plans must be created for each residence with funding made available and guaranteed for any remediation work to be carried out before, during and after site construction.

Response

The works to upgrade Campbell Road at St Peters could result in construction activity within the safe working distances for mitigation of vibration. The greatest potential for encroachment into safe working distances relates to vibration impacts on human comfort, in situations where vibration intensive equipment is used in proximity to residential receivers.

Existing condition surveys would be carried out on properties and structures within the project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works. Buildings which comprise the Campbell Road terraces at 2 to 36 Campbell Road at St Peters are located within the 50-metre zone and would therefore be subject to existing condition surveys.

These condition surveys would be used to establish the existing condition of potentially affected structures. In the unlikely event that damage is shown to have occurred due to the project, consultation would be undertaken with the affected landowner to determine the rehabilitation requirements in order restore the property to its pre-construction condition. All works would be undertaken at no cost to the property owner.

Issue description – general property damage concerns from operation of surface roads

Submissions have raised concerns that the operation of the surface roads (Euston Road) could result in property damage impacts to receivers from vibration.

Response

Vehicles using the upgraded surface roads around the St Peters interchange would not generate vibration at levels likely to lead to impacts to adjoining properties. This is because:

- Vehicles would generate relatively low intensity vibration
- The road pavement wearing course 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 a transmitting material and significant vibration attenuation would be provided by the atmosphere between the vehicle and surrounding receivers.

5.10.10 Respite management measures during construction

One submitter has raised issues in regard to construction management measures relating to respite.

Issue description – respite periods and alternative accommodation

A submission commented that the use of respite periods and offers of alternative accommodation where very high exceedances of the noise management levels would be experienced appears to be a cost saving rather than proper application of the ICNG policy to consider all feasible and reasonable measures.

Response

Where exceedances of construction noise management levels are anticipated both within and outside standard construction work hours, the ICNG recommends strategies for noise mitigation and control (such as acoustic treatment). A tiered approach to identifying and applying construction noise mitigation and management measures has been adopted for the project:

- First, At-source mitigation has been considered. At source mitigation includes selection of plant and equipment, noise attenuation at the source and the installation of acoustic sheds for some construction activities
- Second, intervening noise attenuation has been considered. Measures such as the installation of noise barriers and hoardings along construction site boundaries and other locations has been used to minimise construction noise impacts
- Third, where at-source mitigation and intervening noise attenuation measures have not been sufficient to reduce construction noise impacts below applicable noise management levels, eligibility for consideration of feasible and reasonable at-receiver measures has been identified.

In some cases, there are limited opportunities for at-source mitigation or installation of intervening noise attenuation. This is particularly the case for construction activities including the local road upgrades, which would be located in proximity to local receivers and would be constrained with respect to feasible and reasonable at-source or intervening noise attenuation. For example, the installation of noise barriers along local road upgrades would not be reasonable in terms of impacts on access, visual amenity and overshadowing.

A Construction Noise and Vibration Management Plan would be developed and implemented and would identify the receiver specific mitigation and management measures to be implemented. In selecting specific management measures, the Construction Noise and Vibration Management Plan would take into account the number and sensitivity of potentially affected receivers, the nature and duration of relevant construction activities, and the availability of additional feasible and reasonable 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 receiver.

For receivers affected by exceedances, including exceedances which exceed the sleep disturbance criteria, additional feasible and reasonable construction noise mitigation and management measures would include:

- Letterbox drop – notification of construction activities as part of periodic community updates distributed across areas surrounding construction activities
- Noise verification – receiver or catchment specific noise verification used to confirm the construction noise performance of the project and to proactively inform, where relevant, review and update noise mitigation and management measures, and site construction practices
- Individual briefing – offers of individual briefings about relevant construction activities and potential impacts with potentially affected receivers

- Receiver specific notifications – individual correspondence to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Receiver specific contact – individual phone calls, emails or visits to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Respite periods – programming of feasible and reasonable respite periods for potentially affected receivers
- Alternative accommodation – offers of reasonable alternative accommodation for receivers potentially affected by construction activities conducted at night (from 10.00 pm to 7.00 am). Alternative accommodation would be subject to consultation with the affected receiver and would take into account the duration and intensity of the potential impact.

Ongoing noise monitoring would be undertaken during construction at sensitive receivers during critical periods to identify and assist in managing high risk noise events.

5.10.11 General management measures during construction

34 submitters have raised issues in regard to general management measures during construction.

Issue description – general issues regarding construction management measures

Submissions relating to noise and vibration management measures during construction raised general concerns with the scope and extent of the measures. Concerns included:

- That the EIS did not provide sufficient detail regarding the management measures which would be employed during construction, including management measures for night-time construction works
- That residents should be informed of the instructed and enforced working hours and the noise limits during construction.

Response

A comprehensive construction and vibration impact assessment has been completed throughout the study are of the project. The EIS provides an assessment of construction noise and vibration in Section 12.4.1 and Appendix J (Technical working paper: Noise and vibration) of the EIS. The assessment has been undertaken in accordance with the SEARs and the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009). As part of the assessment, noise modelling was undertaken to predict noise levels resulting from the construction of the project at surrounding receiver locations. It is noted throughout the Technical working paper: Noise and vibration that a typical worst case approach has been adopted for the construction noise assessment and the impact of construction noise would be less than indicated for periods of time.

As required by the ICNG, where applicable noise management levels are expected to be exceeded, consideration has been given to feasible and reasonable noise management measures. Further information on construction noise mitigation and management measures is provided in Section 12.5 of the EIS. A number of construction noise management measures have been recommended and are presented in Section 7.0 of the Technical working paper: Noise and vibration (Appendix J of the EIS).

In developing construction methodologies and a 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 logically and reasonably manage potential impacts within acceptable limits. Opportunities to further reduce construction timeframes while protecting local amenity would be considered during detailed design and construction planning.

Where exceedances of construction noise management levels are expected both within and outside standard construction work hours (i.e. for works which would be undertaken during the night time), the ICNG recommends strategies for noise mitigation and control. A Construction Noise and Vibration Management Plan would be developed and implemented and would identify the receiver specific mitigation and management measures to be implemented. The Construction Noise and Vibration Management Plan would include the following information:

- Identification of nearby residences and other sensitive land uses
- Description of approved hours of work
- Description and identification of construction activities, including work areas, equipment and duration
- Description of what work practices (generic and specific) would be applied to minimise noise and vibration
- A complaints handling process
- Noise and vibration monitoring procedures
- Overview of community consultation required for identified high impact works.

Feasible and reasonable management measures which would be considered during the construction of the project could include:

- Construction site noise would be managed via consideration of the layout of construction compound sites to maximise distance and shielding to nearby receivers
- Appropriate plant and equipment would be selected for each task to minimise noise contributions
- Where feasible and reasonable, alternative work methods such as the use of hydraulic or electric-controlled units in place of diesel units would be consisted and implemented
- The use of alternative machines that perform the same function (such as rubber wheeler plant) would be considered in place of steel tracked plant, and noisy equipment would be orientated away from residential receivers where feasible and reasonable
- Where practicable, consideration would be given to permanent noise barriers being scheduled for completion as early as possible to assist in mitigating construction noise
- Where feasible and reasonable the use of temporary noise walls or hoarding would be investigated where works or compounds are in proximity to residential receivers
- Noise monitoring would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress.

Additional construction noise mitigation and management measures could include:

- Letterbox drop – notification of construction activities as part of periodic community updates distributed across areas surrounding construction activities
- Noise verification – receiver or catchment specific noise verification used to confirm the construction noise performance of the project and to proactively inform, where relevant, review and update noise mitigation and management measures, and site construction practices
- Individual briefing – offers of individual briefings about relevant construction activities and potential impacts with potentially affected receivers
- Receiver specific notifications – individual correspondence to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Receiver specific contact – individual phone calls, emails or visits to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Respite periods – programming of feasible and reasonable respite periods for potentially affected receivers
- Alternative accommodation – offers of reasonable alternative accommodation for receivers potentially affected by construction activities conducted at night (from 10.00pm to 7.00am). Alternative accommodation would be subject to consultation with the affected receiver and would take into account the duration and intensity of the potential impact.

The measures would be developed in consultation with the affected community. The Construction Noise and Vibration Management would require approval from the Department of Planning and Environment.

Ongoing noise monitoring would be undertaken during construction at sensitive receivers during critical periods to identify and assist in managing high risk noise events.

Issue description – widening the scope of noise monitoring

Submissions requested that the scope of the noise monitoring during construction be extended to have regard to 24-hour construction works.

Response

A noise monitoring program would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress. This would include noise monitoring during out-of-hours construction works (where required).

Issue description – management of construction vibration impacts

Page 12-87 of the EIS discusses construction vibration impacts for potential cosmetic damage and to human comfort, however the proposed management measures only address potential cosmetic damage and not human comfort. Given the human comfort criteria are lower than those for cosmetic damage, then more information must be given to show how potential human comfort impacts would be managed, particularly for more vulnerable members of the community.

Response

Community consultation would be undertaken with potentially affected residents and would provide the following information:

- An overview of the construction works to be undertaken
- Programmed times and locations of construction work
- The hours of proposed works
- Construction vibration impact predictions.

Community personnel would investigate the needs of specific at-risk individuals. Opportunities to minimise the impacts of vibration intensive works would be investigated and may include scheduling them to occur at times that would cause the least disruption or by the provision of respite periods.

A construction noise and vibration management plan would be prepared and would include details of construction vibration management measures, such as appropriate equipment selection, working scheduling and vibration monitoring.

Issue description – consultation with affected receivers before commencement of tunnelling

More direct consultation must be undertaken with each of these potentially impacted receivers before approval for night-time tunnelling works is given to determine whether or not this is an acceptable impact to impose on people during the night-time period. The justification for out-of-hours works should be the need to undertake the works out-of-hours due to safety considerations or in cases where there would be no or minimal impact to nearby receivers, as this is the industry standard for undertaking out-of-hours works. It is not acceptable to make a decision for 24 hours works purely on the basis of construction program.

Additionally, the proposed noise and vibration management measures in Section 12.5 do not address this issue as they do not specify consultation with affected receivers prior to works commencing, nor do they contain any specific limitation on size of equipment to mitigate vibration impacts during works of close proximity. Proposed management measure NV30 only requires the preparation and implementation of community consultation protocols, and does not give any certainty that the protocols would actually address this issue.

Response

In developing construction methodologies and a 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. Opportunities to further reduce construction timeframes while protecting local amenity would be considered during detailed design and construction planning.

In most cases, construction sites for the project would be subject to different construction activities during different times in the construction program. This means that peak construction impacts would not be experienced for the entire expected duration of construction works. Section 6.2 of the EIS provides further details of the specific activities and expected duration of construction works at each construction ancillary facility.

To minimise the overall length of construction and the duration of amenity impacts on the local community, tunnelling works are proposed to be carried out 24 hours a day, seven days a week. Tunnelling support activities are therefore required outside of standard construction hours to support continuous tunnelling. This would include heavy vehicle movements to and from tunnel construction sites.

Feasible and reasonable management measures which would be considered during the construction of the project could include:

- Construction site noise would be managed via consideration of the layout of construction compound sites to maximise distance and shielding to nearby receivers
- Appropriate plant and equipment would be selected for each task to minimise noise contributions
- Where feasible and reasonable, alternative work methods such as the use of hydraulic or electric-controlled units in place of diesel units would be consisted and implemented
- The use of alternative machines that perform the same function (such as rubber wheeler plant) would be considered in place of steel tracked plant, and noisy equipment would be orientated away from residential receivers where feasible and reasonable
- Where practicable, consideration would be given to permanent noise barriers being scheduled for completion as early as possible to assist in mitigating construction noise
- Where feasible and reasonable the use of temporary noise walls or hoarding would be investigated where works or compounds are in proximity to residential receivers
- Noise monitoring would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress.

Where exceedances of construction noise management levels are expected both within and outside standard construction work hours, the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009) recommends strategies for noise mitigation and control. A Construction Noise and Vibration Management Plan would be developed and implemented and would identify the receiver specific mitigation and management measures to be implemented. In selecting specific management measures, the Construction Noise and Vibration Management Plan would take into account the number and sensitivity of potentially affected receivers, the nature and duration of relevant construction activities, and the availability of additional feasible and reasonable management measures.

Additional construction noise mitigation and management measures could include:

- Letterbox drop – notification of construction activities as part of periodic community updates distributed across areas surrounding construction activities
- Noise verification – receiver or catchment specific noise verification used to confirm the construction noise performance of the project and to proactively inform, where relevant, review and update noise mitigation and management measures, and site construction practices

- Individual briefing – offers of individual briefings about relevant construction activities and potential impacts with potentially affected receivers
- Receiver specific notifications – individual correspondence to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Receiver specific contact – individual phone calls, emails or visits to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Respite periods – programming of feasible and reasonable respite periods for potentially affected receivers
- Alternative accommodation – offers of reasonable alternative accommodation for receivers potentially affected by construction activities conducted at night (from 10.00pm to 7.00am). Alternative accommodation would be subject to consultation with the affected receiver and would take into account the duration and intensity of the potential impact.

Ongoing noise monitoring would be undertaken during construction at sensitive receivers during critical periods to identify and assist in managing high risk noise events.

Issue description – property treatments and permanent noise barriers (10,000)

A number of environmental management measures for noise and vibration are proposed in the EIS. Of particular concern are the following:

- NV04 – 'Permanent noise barriers would be scheduled for completion as early as possible in order to minimise construction noise.'
- NV05 – 'Property treatments identified for the operational phase of the project would be considered for installation before or early in the construction period, where they would improve noise levels'

Given the number of areas where the EIS delays the detailed assessment of noise and vibration impacts, presumably until after project determination, it is most likely that construction works would commence well before information is available to base noise barrier design on, let alone construct them. Detailed noise and vibration assessment should be included in the EIS rather than deferred to after the project has been assessed and determined so that a more accurate picture of what is proposed is presented to the community for consideration and so that management measures such as these can be realistically implemented.

Response

A detailed construction noise and vibration assessment has been conducted in accordance with the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009) and the SEARs for the project. Noise management measures, including temporary noise barriers, would be implemented to mitigate the noise from the construction phase of the project. NV05 and NV06 are environmental management measures that relate to bringing forward the installation of operational stage noise management measures so that their benefit can be realised early, prior to operation. The opportunity to install permanent noise barriers early would depend on whether the location of the permanent barrier conflicts with the construction footprint.

Issue description – acoustic sheds and temporary noise walls

The number of exceedances of noise management levels (NMLs) and sleep disturbance criteria for spoil handling for NCA 4 and NCA 6-NCA 8 warrants consideration of acoustic sheds and a greater extent of temporary noise walls similar to other compound sites.

A submitter raised concerns that acoustic sheds had not been proposed for the Campbell Road or Canal Road construction compounds.

Response

Noise catchment areas (NCAs) 4, and 6-8 refer to Sydney Park and land to the west of the St Peters interchange, respectively. Results of noise modelling for receivers in these NCAs, as represented in Chapter 12 of the EIS, indicate that elevated construction noise levels, including exceedances of noise management levels would be:

- Dominated by site establishment, bulk earthworks, road upgrade works, demolition activities and kerbing and drainage works
- Not significantly affected by tunnelling activities, including spoil handling.

The use of acoustic sheds is generally only feasible and reasonable for contained construction activities such as spoil handling, and would not offer a practical noise mitigation approach for short duration or dispersed construction works such as site establishment, road upgrade works, demolition activities and kerbing and drainage works. The scale of bulk earthworks required for the project, particularly within the St Peters interchange site also means that acoustic sheds would not be a practical noise management measure for those works.

The construction noise impact assessment has been completed to consider typical worst case scenarios. Section 5.1 of the Technical working paper: Noise and vibration details that noise levels would, for significant periods of time, be less than presented depending on a number of site factors, such as the number of plant in operation, operating conditions, acoustic shielding provided by stockpiles.

Similarly, noise barriers would not offer a practical noise mitigation approach for dispersed activities such as local road upgrades, and kerbing and drainage works. However, noise barriers may be useful in shielding receivers from construction noise generated within major construction sites. Temporary construction noise barriers have already been identified and included in construction compounds with the potential to impact on NCA 4 and NCA 6-NCA 8:

- Along the south-western boundary of the Canal Road construction compound (C8)
- Along part of the northern boundary of the Campbell Road construction compound (C9).

The need for and opportunities to install additional noise barriers, hoardings and / or other noise management measures would be considered during the construction planning phase of the project.

Management measures would be further considered during preparation of the Construction Noise and Vibration Management Plan. Consideration would be given to the layout of the sites in order to maximise distance and shielding to nearby receivers and the extension of compound noise barriers. The construction noise monitoring program would also be detailed in the Construction Noise and Vibration Management Plan.

Issue description – Sydney Park construction compound noise mitigation

A submitter raised concerns regarding potential noise impacts to Sydney Park during construction and requested that a temporary noise barrier be installed around the Sydney Park construction compound.

Response

Generally works within the Sydney Park construction compound (C14) would comprise staff amenities, laydown areas and some parking which do not give rise to high levels of noise.

The construction noise impact assessment has been based on an anticipated worst case scenario, including concurrent operation of all construction plant and equipment, and location of noise sources at the closest point to surrounding receivers. In practice, construction activities would not be carried out all at the same and would be spread over construction sites. For these reasons, construction noise impacts predicted in the EIS are likely to overestimate actual impacts during construction of the project.

Feasible and reasonable management measures would be further considered during detailed design stage and would be addressed in the Construction Noise and Vibration Management Plan which would be prepared in consultation with the EPA. The construction noise monitoring program would also be detailed in the Construction Noise and Vibration Management Plan.

Issue description – effectiveness of ‘quiet’ road surfacing and noisy vehicles

A submission stated that alleged management measures, such as the ‘quiet’ road surfacing is only short term as it wears away.

There is also no effort to pass legislation to catch and fine excessively noisy vehicles.

Response

All road pavements wear away over time and require periodic maintenance. The frequency and extent of maintenance activities would depend on the nature of the road pavement, environmental conditions and the types and volumes of traffic travelling on the pavement. Road pavements installed as part of the project would be maintained to ensure that they continue to perform within design requirements, including in relation to safety and noise performance.

Noise from vehicles is regulated by the EPA under the *Protection of the Environment Operations (Noise Control) Regulation 2008*. NSW Police are also empowered to issue penalty infringement notices relating to vehicle noise under the *Road Transport (Safety and Traffic Management) Act 1999*.

Issue description – management measures for St Peters Public School

Submissions requested confirmation of the management measures that would be implemented at St Peters Public School.

Response

One school building at St Peters Public School and the St Peters Community Pre-school (which is classified as a childcare centre under the NSW Road Noise Policy) are eligible for consideration of additional noise mitigation during the daytime only based on the current design of the project and the road traffic noise assessment.

The eligibility of St Peters Public School and St Peters Community Pre-school for noise mitigation would be confirmed during detailed design and based on measured noise measurements specific to these locations.

The types of at-property treatment that would be considered at St Peters Public School and neighbouring pre-school would be informed by an inspection of the property and consultation with the Department of Education. Broadly, two categories of at-property treatments would be considered:

- Type 1 – for exceedances of up to 10 dB(A) over the Noise Criteria Guideline (NCG) (RMS, 2015) target, at-property treatments may include upgrading door and window seals, sealing of wall vents and fresh air ventilation
- Type 2 – for exceedances of more than 10 dB(A) over the NCG criteria, at-property treatments may include the treatments listed for Type 1 above, plus additional upgrades to windows and doors.

Suitable noise mitigation would be developed in consultation with the St Peters Public School.

Issue description – noise attenuation measures at Arncliffe

A submission recommended that the project should include noise attenuation measures for residences in proximity to roads such as Marsh Street and Wickham Street, and Forest Road and Stoney Creek Road, in order to offset the increase in noise associated with the increase in traffic predicted to use these parallel routes, both during construction and operation of the project.

Response

The operational traffic noise assessment study area for the project has been established in accordance with the *NSW Road Noise Policy* (RNP) and study areas defined using the *Noise Criteria Guideline*. As described in Section 6.1.2 of Technical working paper: Noise and vibration (Appendix J in the EIS), this generally involves identifying areas within 600 metres of the outside traffic lane of the roads forming part of the project. In some cases, this area may be reduced where other significant road noise sources dominate noise levels at nearby receivers.

It is recognised that the project would lead to a redistribution of traffic beyond those roads directly affected by project works. Traffic forecasts were reviewed to identify roads in the surrounding road network that may be significantly affected by redistributed traffic, and those roads were also included in the operational traffic noise assessment.

Marsh Street, Wickham Street and Forest Road are all located outside the operational traffic noise assessment study area, and none of these roads were identified as being significantly affected by

redistributed traffic. As such, these roads were not required to be assessed under the RNP. No assessment of traffic noise mitigation along these roads was required.

Although Stoney Creek Road is located outside the operational traffic noise assessment study area, it was identified as likely to be affected by redistributed traffic as a result of the project. Operational traffic noise impacts along Stoney Creek Road were therefore assessed, with results summarised in Section 6.1.11 of the Technical working paper: Noise and vibration (Appendix J of the EIS). This assessment indicates that the project would result in less than a 2 dB(A) increase in traffic noise along Stoney Creek Road, which is the threshold above which consideration of feasible and reasonable noise mitigation is required under the RNP. On this basis, no additional noise attenuation along Stoney Creek Road is required.

5.10.12 Compensation / relocation management measures during construction

Five submitters have raised issues and / or requests regarding compensation or relocation during construction.

Issue description – compensation for noise and vibration impacts on residents

Submitters questioned whether compensation would be provided in addition to management measures, particularly for night works.

Response

For receivers that are anticipated to experience elevated noise levels during construction, further mitigation and management measures would be considered depending on the extent to which noise impacts exceed applicable noise management levels and background noise levels. These measures may include:

- Letterbox drop – notification of construction activities as part of periodic community updates distributed across areas surrounding construction activities
- Noise verification – receiver or catchment specific noise verification used to confirm the construction noise performance of the project and to proactively inform, where relevant, review and update noise mitigation and management measures, and site construction practices
- Individual briefing – offers of individual briefings about relevant construction activities and potential impacts with potentially affected receivers
- Receiver specific notifications – individual correspondence to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Receiver specific contact – individual phone calls, emails or visits to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Respite periods – programming of feasible and reasonable respite periods for potentially affected receivers
- Alternative accommodation – offers of reasonable alternative accommodation for receivers potentially affected by construction activities conducted at night (from 10.00pm to 7.00am). Alternative accommodation would be subject to consultation with the affected receiver and would take into account the duration and intensity of the potential impact.

5.10.13 Noise from construction compounds

Two submitters have raised issues regarding noise from construction compounds.

Issue description – noise from construction compounds

Submissions requested that residents be informed of noise levels from the construction compounds, including temporary car parks and site sheds.

Response

The noise associated with the operation of compound sites would primarily result from the operation of fixed and mobile plant and truck movements. Consideration would be given to the layout of the site in order to maximise distance and shielding to nearby receivers.

Predicted exceedances of the noise management levels for tunnelling and non-tunnelling construction compound activities are presented in the following tables in the EIS:

Western surface works area:

- Surface construction works, including:
  - Surface works (outside construction compound sites), including earthworks, vegetation clearing and surface road works(refer to Table 12-17 of the EIS)
- Construction compound activities (non-tunnelling), including:
  - General non-tunnelling construction activities (Kingsgrove North (C1), Kingsgrove South (C2) and Commercial Road (C3) construction compounds) (refer to Table 12-24 of the EIS)
- Tunnelling and tunnelling support activities, including:
  - General construction compound and carpark activities during tunnelling (refer to Table 12-27 of the EIS).

Bexley Road surface works area:

- Construction compound activities (non-tunnelling), including:
  - Construction of the Bexley Road motorway operations complex (MOC2) (refer to Table 12-25 of the EIS)
- Tunnelling and tunnelling support activities, including:
  - General construction compound and carpark activities during tunnelling (refer to Table 12-27 of the EIS).

Arncliffe surface works area

- Construction compound activities (non-tunnelling), including:
  - Construction of the Arncliffe motorway operations complex (MOC3) (refer to Table 12-25 of the EIS)
- Tunnelling and tunnelling support activities, including:
  - General construction compound and carpark activities during tunnelling (refer to Table 12-27 of the EIS).

St Peters interchange and local road upgrades surface works area

- Construction compound activities (non-tunnelling), including:
  - General non-tunnelling construction activities (Canal Road (C8), Campbell Road (C9), landfill closure (C10), Burrows Road (C11), Alexandra Canal Bridge (C12), Gardeners Road Bridge (C13) and Sydney Park (C14) construction compounds) (refer to Table 12-24 of the EIS)
- Tunnelling and tunnelling support activities, including:
  - General construction compound and carpark activities during tunnelling (refer to Table 12-27 of the EIS).

Sheds would be erected at the construction compounds that would support 24 hour tunnelling activities. Acoustic sheds would be constructed at the Kingsgrove North (C1), Bexley Road North (C4) and Bexley Road South (C5) construction compounds. The indicative insertion loss (ie reduction in noise levels from activities on the site) of the acoustic sheds would be around 25 dB(A), however this would be confirmed during the detailed design phase. During night time tunnelling activities, all works would be located within the sheds. Non-acoustic sheds would be erected at the Commercial Road

(C3) and Arncliffe (C7) construction compounds. The indicative insertion loss of the non-acoustic sheds would be around 10 dB(A), however this would be confirmed during the detailed design phase.

Construction road traffic noise would be generated by vehicles associated with the construction of the project, including heavy vehicles transporting spoil and light vehicle movements generated by construction workers.

Construction vehicle movements would be generated by all compounds, however, the Kingsgrove South construction compound (C2) vehicles would access / depart via the Kingsgrove North construction compound (C1). Tunnel support compounds, which would generate the majority of spoil vehicles, are located at the Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Arncliffe (C7) and Canal Road (C8) construction compounds.

Construction traffic noise has been assessed during:

- The AM peak period, 6.30am to 9.30am (refer to Table 12-42 of the EIS)
- The PM peak period, 3.30pm to 7.00pm (refer to Table 12-43 of the EIS)
- An AM off-peak hour, being the lowest non-peak traffic hour between 9.30am and 3.30pm (refer to Table 12-44 of the EIS)
- A PM off-peak hour, being the lowest non-peak traffic hour between 7.00pm and 6.30am (refer to Table 12-45 of the EIS).

The tables summarise:

- The existing forecasted traffic flow
- The expected construction traffic generated by the project
- The calculated increase in road traffic noise along construction traffic routes (resulting from construction traffic).

The calculated increase in road traffic noise attributable to the project has been analysed, and anticipated increases of 2 dB(A) have been highlighted in the tables in the EIS.

A Construction Noise and Vibration Management Plan would be prepared prior to the start of construction and would identify receiver specific mitigation and management measures to be implemented. In selecting specific management measures, the Construction Noise and Vibration Management Plan would take into account the number and sensitivity of potentially affected receivers, the nature and duration of relevant construction activities, and the availability of additional feasible and reasonable management measures.

Issue description – temporary noise barriers along Campbell Road at St Peters

A submission requested the following changes to the Campbell Road construction compound:

- Move the construction compound 50 metres to the west (away from Campbell Road)
- Temporary noise barrier be higher than the proposed 2.5 metres.

Response

The temporary noise barrier within the Campbell Road construction compound (C9) is a component of a set of management measures which would minimise as far as feasible and reasonable temporary noise impacts to receivers along Campbell Road at St Peters during construction.

The construction noise impact assessment has been completed to consider typical worst case scenarios. Section 5.1 of the Technical working paper: Noise and vibration (Appendix J of the EIS) states that noise levels would, for significant periods of time, be less than what has been assessed in the EIS depending on a number of site factors, such as the number of plant in operation, operating conditions, and acoustic shielding provided by stockpiles.

Management measures would be further considered during the detailed design phase and detailed in the Construction Noise and Vibration Management Plan. Consideration would be given to the layout of the Campbell Road construction compound (C9) in order to maximise distance and shielding to

nearby receivers and the potential extension of compound noise barriers, where feasible and reasonable. The construction noise monitoring program would also be detailed in the Construction Noise and Vibration Management Plan.

Receivers along Campbell Road would be most affected by noise generated by the earthworks for local road works (during the day time) and kerbing and drainage for the local road works (during the night time). Noise from the general operations of the Campbell Road construction compound (C9) are not anticipated to result in exceedances of the applicable noise management levels along Campbell Road during the daytime or night time periods.

The location of construction ancillary facilities is largely determined by the location of permanent operational infrastructure including roads and tunnels. The establishment of construction ancillary facilities within or adjacent to permanent operational infrastructure is advantageous as it improves the efficiency of deliveries and other movements between construction ancillary facilities and construction activities in the road corridor. The layout and access arrangements for construction ancillary facilities would be refined during detailed design.

5.10.14 Level and quality of the operational assessment

2,711 submitters have raised issues regarding the level and quality of the operational noise and vibration assessment.

Issue description – choice of sensitive receivers and noise criteria

Concerns were raised over the absence of a noise and vibration assessment for residents above two storeys and a number of education facilities, including Arncliffe Public School.

Response

The determination of noise levels at multi-level residential buildings has been undertaken in accordance with the *Noise Criteria Guideline* (NCG) (RMS, 2015) and the *NSW Road Noise Policy* (RNP) (DECCW, 2011). The external points of reference for measurement and assessment of operational noise impacts are the two floors of the building that are most exposed to traffic noise. On other floors, the internal noise level should be at least 10 dB(A) less than the relevant external noise level on the basis of openable windows being opened sufficiently to provide adequate ventilation.

Arncliffe Public School is outside of the study area for the noise and vibration assessment. The school is outside the area anticipated to experience significant changes in noise levels as a result of the project.

The noise and vibration assessment study area is shown in Figure 12-1 of the EIS. The study area for the construction and operational sites was determined by:

- Identifying construction activities and sites, and operational sites, with the potential to generate noise, including each of the surface works areas: the western surface works area, the Bexley Road surface works area, the Kingsgrove surface works area, the Arncliffe surface works area, and the St Peters interchange and local road upgrades surface works area
- Identifying noise sensitive receivers around each activity and site with the potential to generate noise. Noise sensitive receivers were identified through aerial photography and all structures in the project area, except for those to be acquired and demolished, were subject to visual ground-truthing. This exercise, in conjunction with cadastral information, was used to determine the classification of buildings into residential, commercial, industrial, educational, recreational and other uses (such as sheds and the like)
- Grouping receivers into a series of 30 noise catchment areas (NCAs) based on location, the nature of the receivers and local conditions (such as topography and proximity to other major noise sources). The extent of each NCA was established based on the anticipated extent of discernible noise impacts around each construction and operational activity / site
- The 30 NCAs together form the noise study area for construction and operational sites.

Appendix C of the Technical working paper; Noise and vibration (Appendix J of the EIS) identifies the use of each building assessed. This Appendix can be used to determine if the buildings use has been correctly identified as follows:

- Our Lady of Fatima Primary – These buildings were erroneously identified as St Ursula's College. The assessment has assumed the correct use of the building
- Bexley North Primary – This is outside the project study area
- Kingsgrove Primary – This is outside project study area
- Kingsgrove High – This is outside the project study area
- Babies Oasis (Day Care centre) Kingsgrove Avenue – This receiver is outside the project study area for the operational noise assessment. This receiver was assessed as residential in the construction noise assessment. Management measures would be further considered during detailed design stage during preparation of the Construction Noise and Vibration Management Plan
- St Pius at St Peters – The buildings associated with this school have been correctly identified and assessed, however they were inadvertently not listed in Table 11 of Appendix J: Technical working paper: Noise and vibration in the EIS
- St Peters Community Preschool - The buildings associated with this preschool have been correctly identified and assessed. They were considered as part of St Peters Public School and listed as such in Table 11 of Appendix J: Technical working paper: Noise and vibration in the EIS
- OOSH St Peters - The buildings used by OOSH are understood to be part of St Peters Public School. These buildings have been assessed as such
- St Peters Playgroup - The buildings associated with this playgroup are understood to be part of St Peters Church and have been identified and assessed as such
- Erskineville Primary – This is outside the project study area.

Further information on the determination of the study area for the noise and vibration assessment is provided in Section 12.1.1 of the EIS.

Roads and Maritime would give consideration to at-property acoustic treatments to all levels of multistorey residential dwellings exceeding Road Noise Policy assessment criteria. This consideration would include a feasible and reasonable review of at-property treatments during detailed design to confirm the effectiveness of any treatments in reducing noise.

Issue description – noise modelling methodology and terminology

Submissions queried the effect of loud, random noises on L_{Aeq} and whether these 'unrepresentative' events were removed from the noise modelling.

Submissions also stated that operational noise levels have been measured in decibels which is misleading as it measures loudness not intensity which can damage hearing.

Response

Extraneous noise events ('unrepresentative' noise events) were excluded from ambient noise measurements in accordance with the *Industrial Noise Policy* (EPA, 2000). If these extraneous noise events were not excluded background noise levels would have been unrealistically and unrepresentatively high.

The use of decibels to report noise levels is common practice and consistent with the requirements of current noise assessment policy in New South Wales. Decibels can be used to measure both sound intensity levels and sound pressure levels objectively.

Loudness is a subjective measure and the most commonly used unit of measurement is the phon. Phons are not used for any environmental noise impact assessment in Australia.

Issue description – noise and vibration study area and extent of impacts

A submission noted that the way the EIS is presented made it difficult for residents to see whether their neighbourhoods would be affected by excessive noise levels or not.

Response

The following appendices to the Technical working paper: Noise and vibration (Appendix J of the EIS) include maps showing the noise and vibration study area and the potential construction and operational impacts to neighbourhoods around the works:

- Construction airborne noise L_{Aeq} maps (Appendix G)
- Construction airborne noise L_{A1} maps (Appendix I)
- Construction ground-borne noise L_{Aeq} maps (Appendix J)
- Construction vibration maps (Appendix K)
- Operational noise results – road traffic noise maps (Appendix L)
- Operational noise results – fixed facility noise maps (Appendix O).

These maps provide a clear and accessible presentation of the anticipated noise impacts of the project.

Issue description – background noise measurements

Submissions raised concerns regarding the background noise measurements which were undertaken for the project. Specific concerns included:

- Two nights of the results for St Peters were excluded due to rain, which equates to almost 30 per cent of the results not being useable. This is too significant a gap to be able to have confidence in the conclusions that have been reached on the basis of these results
- The background noise for NCA06 was measured at NL02 (located on Campbell Street), which has significantly more traffic noise than any of the local streets located in the NCA. It should not be considered indicative of the NCA, and background noise levels for residences offset from major roads should be corrected prior to consideration of operational noise impacts
- The EIS failed to undertake measurements and modelling of noise impacts for Euston Road, Unwins Bridge Road, Edgeware Road, Mitchell Road or Maddox Street at Alexandria, and surrounding roadways
- Duration and timing of background noise measurements at NL02
- Limitations of background noise measurements.

Response

Rain and wind affected measurements

Any data which was affected by adverse weather conditions was excluded. When wind exceeds a certain speed it can lead to the generation of extraneous noise as it blows through leaves. Any data measured during periods when wind speeds exceeded five metres per second have been excluded in accordance with the Industrial Noise Policy. The exclusion of data is undertaken to provide a conservative assessment. Including this data in some cases could lead to more relaxed noise criteria. The weather data used was from an official Bureau of Meteorology station which was deemed to be closest representative station.

The effects of wind and rain on noise measurements cannot be easily quantified therefore only noise measurement data collected under normal weather conditions are used to validate the road traffic noise model.

Wind has little impact of noise levels over short distances that are considered in this assessment. Wind impacts typically only become noticeable above 500 metres, which is approaching the maximum distance the calculation algorithms can be used to calculate noise (600 metres)

Whilst rain affected data was excluded for NL02, NL03 and NL05 there was sufficient data to meet the minimum requirements of the *Industrial Noise Policy* (EPA, 2000). The background noise measurements are therefore sufficient for the purpose of informing the noise impact assessment.

Background noise for NCA 06

Noise measurements were made at three locations (NL02, NL05 and NL19) close to NCA06. It can been seen from Table 13 of the Technical working paper: Noise and vibration (Appendix J in the EIS) that the noise levels measured at NL02 were the lowest and therefore provided the most conservative construction noise management levels in the area.

Whilst background noise levels may be lower within NCA06 away from major roads and further from the construction works, predicted noise levels would also be lower due to distance loss and shielding. The assessment locations are appropriate to facilitate a worst case assessment and to determine appropriate noise management measures for NCA06.

In the development of the Construction Noise and vibration Management Plan Roads and Maritime would undertake further work to confirm background noise levels and construction noise criteria.

Duration and timing of noise measurements

All noise logging was completed outside of NSW School holidays. Table 12 of Appendix J: Technical Working Paper: Noise and Vibration in the EIS presents the dates that the noise logging was completed for each logger location.

Road traffic noise levels were measured for between seven and 16 days. Specifically at location NL02 measurements were made for a period of ten days. This length of time has been proven to be suitable for the establishment of background noise levels, as discussed in the *NSW Industrial Noise Policy* (EPA, 2000).

All logging equipment was calibrated before and after measurements and was found to be in good calibration.

Measurements and modelling of Euston Road, Mitchell Road, Maddox Street and surrounding roads

The operational traffic noise assessment study area for the project has been established in accordance with the *NSW Road Noise Policy* (RNP). As described in Section 6.1.2 of Technical working paper: Noise and vibration (Appendix J in the EIS), this generally involves identifying areas within 600 metres of the outside traffic lane of the roads forming part of the project. In some cases, this area may be reduced where other significant road noise sources dominate noise levels at nearby receivers. In accordance with the Roads and Maritime's Noise Criteria Guideline the width of the study area has been reduced to where the noise levels from the project contribute slightly less than half of the total noise level. This is considered to be where the project adds no more than 2.0 dB(A) to the total noise level. These boundaries have been adjusted to coincide with natural boundaries such as roads, as far as possible. A map of the St Peters interchange area is provided in Appendix F of the Technical working paper: Noise and vibration (Appendix J of the EIS).

Euston Road, and the receivers along, fall within the operational traffic noise assessment study area and have been included in the road traffic noise assessment.

It is recognised that the project would lead to a redistribution of traffic beyond those roads directly affected by project works. Traffic forecasts were received to identify roads in the surrounding road network that may be significantly affected by redistributed traffic, and those roads were also included in the operational traffic noise assessment. Around the St Peters interchange, this included Moorefields Road, William Street, Homer Street / Bayview Avenue, Unwins Bridge Road, O'Riordan Street, Gardeners Road and Sydney Park Road.

Because Mitchell Road, Maddox Street and other surrounding roads would not be directly affected by the project, and would not be subject to significant traffic redistribution effects, these roads were not included in the operational road traffic noise assessment. However, based on the level of community interest in road traffic noise along roads including Mitchell Road and Maddox Street, additional road traffic noise modelling has been carried out. For a selection of additional roads, the following tables present:

- Anticipated changes in traffic volumes with and without the project in 2021 (refer to **Table 5-10**) and how this would affect traffic noise levels (refer to **Table 5-11**)
- Anticipated changes in traffic volumes with and without the project in 2031 (refer to **Table 5-12**) and how this would affect traffic noise levels (refer to **Table 5-13**).

The tables show that along the roads that have been assessed, the project would not lead to an increase in road traffic noise levels by more than 2 dB(A) and therefore no further consideration of noise management measures is required. In many cases, the tables show that the project would lead to a decrease in traffic noise levels.

Table 5-10 Year 2021 parallel routes traffic volumes

Location	Build				No Build			
	Daytime (7am – 10pm)		Night-time (10pm – 7am)		Daytime (7am – 10pm)		Night-time (10pm – 7am)	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
Euston Road	28531	1210	6839	243	24906	1463	5024	227
Bourke Road	9130	1558	1818	262	11534	1222	2696	209
O'Riordan Street	33040	2482	6442	507	33959	2492	6768	490
Gardeners Road	34030	3378	4909	430	32236	3350	5712	417
Sydney Park Road	14821	382	3382	48	51115	1875	11502	260
Mitchell Road	15888	242	2511	12	24320	159	5800	20
Fountain Street	21565	530	3881	52	16851	625	3126	51
Maddox Street	7458	836	2188	146	11465	519	2882	70

Table 5-11 Year 2021 parallel routes noise impact, 10 metres from the kerb, dB(A)

Location	Build		No Build		Increase in noise	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
Euston Road	71	67	72	66	-0.2	0.8
Bourke Road	71	66	70	65	1.0	0.7
O'Riordan Street	74	69	74	69	0.0	0.1
Gardeners Road	75	68	75	68	0.1	0.0
Sydney Park Road	68	63	74	69	-6.0	-5.9
Mitchell Road	67	61	68	64	-1.2	-3.5
Fountain Street	69	63	69	62	0.3	0.7

Table 5-12 Year 2031 parallel routes traffic flows

Location	Build				No Build			
	Daytime (7am – 10pm)		Night-time (10pm – 7am)		Daytime (7am – 10pm)		Night-time (10pm – 7am)	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
Euston Road	26422	1615	5693	321	21529	1454	4738	219
Bourke Road	6638	1197	1257	83	9930	1085	2160	194
O'Riordan Street	33079	2143	6796	403	32103	2642	6619	477
Gardeners Road	28945	3237	4749	400	28911	2744	5262	318
Sydney Park Road	14247	596	3277	89	45517	1461	9206	207
Mitchell Road	11872	211	1955	7	21996	147	4630	18
Fountain Street	19013	688	3273	67	13378	592	2790	61
Maddox Street	1724	64	2951	212	1604	67	4109	479

Table 5-13 Year 2031 parallel routes noise impact, 10 metres from the kerb, dB(A)

Location	Build		No Build		Increase in noise	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
Euston Road	72	67	71	66	0.6	1.3
Bourke Road	70	61	70	65	0.4	-3.4
O'Riordan Street	73	68	74	69	-0.6	-0.5
Gardeners Road	74	68	74	67	0.6	0.6
Sydney Park Road	68	63	73	68	-4.5	-4.2
Mitchell Road	66	60	68	63	-1.9	-3.8
Fountain Street	69	63	68	62	1.1	0.6
Maddox Street	59	65	59	68	0.1	-3.2

Limitations of background noise measurements

Ambient noise monitoring was completed in accordance with the NSW Road Noise Policy, the Noise Criteria Guideline and the Noise Mitigation Guideline. The existing road traffic noise model validation provides information on the suitability of the measurements to inform the study. The validation process concluded that the model validated well and from this a reasonable level of confidence in the predicted road traffic noise levels is achieved.

A post construction noise assessment would be undertaken within 12 months of the completion of construction to ensure that appropriate noise mitigation has been incorporated in the project. Further mitigation may be considered at this point if the designed noise mitigation does not meet the requirements of the project.

Issue description – noise and vibration data presented in EIS

Submissions stated that independent experts have reported that some of the tables are inaccurate in the noise report and are therefore not reliable. Submissions stated that on this basis the operational noise model appears to be inadequate and should be revisited.

Specific inaccuracies or errors are claimed to include:

- Noise predictions contained within various tables of the Technical working paper: Noise and vibration (Appendix J of the EIS) show median L_{Aeq} and maximum L_{Aeq} results as the same or very close numerical value. Given a median should be the midpoint value and the maximum should be the highest value it is not clear why they would be the same or only 1 dB(A) different
- There is at least one inaccuracy in the calculation of the noise management levels (NMLs) between Table 12-2 and Table 12-4 of the EIS as the rating background (RBLs) given in Table 12-2 of the EIS for noise monitoring location (NL) 02 and for noise catchment areas (NCA) 2, 3 and 6 in Table 12-4 differ when they should be the same. This in turn means that not all of the construction NMLs that are given are accurate
- The EIS notes that the increase in noise on Campbell Street is 22 dB(A), and yet the increase in traffic noise on Unwins Bridge Road is identified at only 1 dB(A). Given that all the additional traffic on Campbell Street is going to either go straight onto Bedwins / Edgeware Road, or left onto Unwins Bridge Road, it is not feasible that the traffic increase on Unwins Bridge Road is 1dB(A). In addition there is no mention of the increase in operational traffic noise impacts on Edgeware Road.

Response

Median and maximum noise levels are generally not close numerically (refer to Section 5.1.1 of the Technical working paper: Noise and vibration (Appendix J of the EIS)). However, exceptions do occur.

The noise levels predicted for NCA 4 are generally close. This is due to there being two small 'clusters' of residential receivers within the noise catchment area more than 650 metres apart. Where noise levels are less than 30 dB(A) at receivers they are excluded, which would lead to a whole 'cluster' being excluded. Therefore the median and maximum noise levels represent a small number of residential receivers which are located in very close proximity to each other. These closely clustered residential receivers would experience similar background noise levels, and it therefore follows that there is not much variation in the noise levels at each individual residential receiver (nor any significant difference in median and maximum noise levels).

A transcription error resulted in the incorrect rating background levels (RBLs) being presented Table 12-4 of the EIS. Table 16 in the Technical working paper: Noise and vibration (Appendix J of the EIS) presents the correct RBLs. The correct RBLs and correct construction noise management levels have been used in the construction noise impact assessment.

The current road traffic volumes on Campbell Street / Campbell Road are relatively low when compared to the future predicted road traffic volumes. Although road traffic volumes would also increase on Unwins Bridge Road and Bedwin Road, the relative increases in road traffic volumes are significantly lower than Campbell Street. Therefore the increase in noise is also much less. Road traffic noise levels are predicted to decrease for Edgeware Road due to traffic switching from Bedwin Road to Edinburgh Road.

In addition, on Campbell Street / Campbell Road buildings are being removed which currently provide shielding of more than 10 dB(A) to the most affected sensitive receivers. Removal of these buildings would remove the shielding and contribute to predicted noise levels at other receiver locations. This effect is in addition to additional traffic noise contributions. The effect of removing existing shielding is not experienced to the same degree (and in most cases, not all) along other roads.

It is relevant to note that Campbell Street would also be located closer to receivers as a result of the project.

These three factors have resulted in increases in traffic noise along Campbell Street / Campbell Road appreciably greater than along surrounding roads.

Issue description – review of noise and vibration data presented in EIS

Submitters requested an independent review of the noise and vibration data, including noise measurements, modelling and proposed management measures.

Response

As part of the EIS preparation and assessment process, the Technical working paper: Noise and vibration (Appendix J of the EIS) has been reviewed by an independent reviewer appointed by the technical consultant, by Roads and Maritime noise specialists, the EPA and by an independent expert appointed by the Department of Planning and Environment.

Issue description – existing road traffic noise model

A submitter queried whether night time background noise measurements took into account current night time curfews for heavy vehicles on Campbell Street, and whether this curfew would remain in place.

Response

Background noise measurements were taken under existing conditions, including current heavy vehicle curfews.

The heavy vehicle curfew along Campbell Street would be further considered and confirmed during detailed design, as part of the broader consideration of mitigation and management of operational road traffic noise levels.

Issue description – noise catchment area NCA 2 clarification

A submitter queried why NCA02 did not extend to the Alice Street / Llewellyn Street intersection with Edgeware Road at St Peters in the noise and vibration assessment.

Response

The Alice Street / Llewellyn Street intersection with Edgeware Road does not occur within the noise assessment study area, and has not been identified as significantly affected by redistributed traffic. On this basis, a detailed assessment of traffic noise at this location was not required.

The operational traffic noise assessment study area for the project has been established in accordance with the *NSW Road Noise Policy* (RNP) and study areas defined using the *Noise Criteria Guideline*. As described in Section 6.1.2 of Technical working paper: Noise and vibration (Appendix J in the EIS), this generally involves identifying areas within 600 metres of the outside traffic lane of the roads forming part of the project. In some cases, this area may be reduced where other significant road noise sources dominate noise levels at nearby receivers.

It is recognised that the project would lead to a redistribution of traffic beyond those roads directly affected by project works. Traffic forecasts were reviewed to identify roads in the surrounding road network that may be significantly affected by redistributed traffic, and those roads were also included in the operational traffic noise assessment.

Issue description – noise logger locations NCA 2 and NCA 3

Concerns were raised over the absence of noise loggers in NCA02 and NCA03, given that sensitive receivers are located within these catchment areas.

Response

The measurements at noise logger location NL02 were used to represent the noise environment throughout NCA02 and NCA03.

NL02 was located across Campbell Street from NCA03. Considering Campbell Street is the controlling noise source in this area, the noise levels would be consistent on both sides of the road. NCA02 was adjacent to NCA03 on the north side of Campbell Street. The noise measurements made at NL02 were deemed appropriate for both NCA02 and NCA03.

Issue description – no cumulative noise assessment for diesel trucks

Concerns were raised that the cumulative impact of extra diesel trucks on noise over the entire WestConnex program of works has not been assessed.

Response

Section 12.4.2 and Appendix J (Technical working paper: Noise and vibration) of the EIS provide an operational noise assessment, including an assessment of potential traffic noise. This assessment considers the potential increase in operational traffic noise and feasible and reasonable management measures where receivers are anticipated to experience noise levels above applicable road traffic noise assessment criteria.

The operational noise assessment includes consideration of road traffic noise impacts as a result of the New M5 for the nominal year of opening (2019) and 10 years after the nominal year of opening (2031). Specifically, the future year scenario for 2031 assumes that the full WestConnex program of works is in operation (including the future M4–M5 Link) and the future Southern Connecter. The operational traffic noise assessment has been based on traffic forecasts for the 2021, 2031 and cumulative WestConnex scenarios, and has therefore taken into account noise contributions from heavy vehicles (including diesel trucks) in each of these scenarios

Section 6.1.1 of the noise and vibration technical paper describes the three effective noise sources which comprise a 'car' source with height of 0.5 metres above the road pavement and two 'truck' sources at two separate heights representing the noise emission from truck tyres and truck engines (1.5 metres above the road pavement) and truck exhausts (3.6 metres above the road pavement). These sources are included in the noise prediction model for the project.

The road traffic noise model took into account the relative source contributions of the truck tyres and engines (-0.6 dB(A)) and truck exhausts (-8.6 dB(A)) compared with light vehicle sources.

Issue description – noise predictions for receivers on Edgeware Road and Unwins Bridge Road

A submission raised concerns that the assessment of road noise level increases on Edgeware Road and Unwins Bridge Road at St Peters was inadequate.

Response

The operational road noise assessment has been carried out in accordance with the *Noise Criteria Guideline* (RMS, 2015). The guideline provides guidance on how to implement the *NSW Road Noise Policy* (DECCW, 2011) for Roads and Maritime projects. As described in Section 6.1.2 of Technical working paper: Noise and vibration (Appendix J in the EIS), this generally involves identifying areas within 600 metres of the outside traffic lane of the roads forming part of the project. In some cases, this area may be reduced where other significant road noise sources dominate noise levels at nearby receivers.

It is recognised that the project would lead to a redistribution of traffic beyond those roads directly affected by project works. Traffic forecasts were reviewed to identify roads in the surrounding road network that may be significantly affected by redistributed traffic, and those roads were also included in the operational traffic noise assessment.

Neither Edgeware Road nor Unwins Bridge Road fall within the noise assessment study area, and neither road has been identified as significantly affected by redistributed traffic. On this basis, a detailed assessment of traffic noise along these two roads was not required.

Issue description – noise predictions for receivers on Brown Street

Submissions requested additional detail regarding noise monitoring data for residential receivers at Street at St Peters, and clarification on the predicted change in noise at the property.

Response

Existing traffic noise levels at 9 Brown Street at St Peters, are most closely represented by noise monitoring data from monitoring location NL02. However, it should be noted that NL02 was located only four metres from Campbell Street, which is significantly closer than the 9 Brown Street property. Because of this, existing traffic noise levels at 9 Brown Street are likely to be lower than the noise levels recorded at NL02.

Table 14 of the Technical working paper: Noise and vibration (Appendix J of the EIS) summarises measured existing traffic noise levels. For NL02, existing traffic noise was measured at 68 dB(A) during the day time ($L_{Aeq(15\ hour)}$) and 64 dB(A) during the night time ($L_{Aeq(9\ hour)}$).

Appendix L in the Technical working paper: Noise and vibration (Appendix J of the EIS) includes maps that show the modelled operational noise levels as a result of the project in 2021 and 2031, as well as the anticipated change in noise levels relative to the 'without project' scenario. In relation to 9 Brown Street, the maps show that:

- Noise during the day time is anticipated to be around 58-60 dB(A) ($L_{Aeq(15\ hour)}$) and around 53-55 dB(A) during the night time ($L_{Aeq(9\ hour)}$) in 2021
- Noise during the day time is anticipated to be around 56-58 dB(A) ($L_{Aeq(15\ hour)}$) and around 53-55 dB(A) during the night time ($L_{Aeq(9\ hour)}$) in 2031.

5.10.15 Operational traffic noise

1,988 submitters have raised issues regarding traffic noise during the operation of the project.

Issue description – general traffic noise concerns

Submissions raised general concerns that increased noise from project operation would affect residential properties, public recreation sites and commercial areas in communities surrounding the project.

Response

Around the existing M5 East Motorway in the Kingsgrove area, road traffic volumes would reduce as a result of the project. This would result in an appreciable reduction in noise levels for residential receivers along the alignment of the project and M5 East Motorway (between Beverly Hills and Kingsgrove).

Road traffic noise levels at all, commercial properties and places of worship within the project study area are predicted to comply with the assessment criteria.

For the area around the St Peters interchange and the local road upgrades the night-time period was the more stringent time period for the operational traffic noise assessment. Road traffic noise levels at a total of 145 residential sensitive receivers exceeded the $L_{Aeq(9hour)}$ noise assessment criterion. In accordance with the *Noise Mitigation Guideline* (RMS, 2015) it was not reasonable to consider additional noise management measures at receivers that would experience an increase in road traffic noise levels of 2 dB(A) or less, and which were not considered 'acute.' As such a total of 144 residential receivers were considered for additional noise management measures.

In addition, one school building at St Peters Public School and the St Peters Community Pre-school (which is classified as a child care centre under the NSW Road Noise Policy) are eligible for consideration of additional noise mitigation during the daytime only.

The St Peters community pre-school is eligible for consideration for both external and internal areas of the property. Road traffic noise levels at all other childcare centres, commercial properties and places of worship are predicted to comply with the criteria.

The eligibility of St Peters Public School and St Peters Community Pre-school for noise mitigation would be confirmed during detailed design and based on measured noise measurements specific to these locations.

Chapter 6 of this report clarifies the eligibility of buildings at the St Peters Public School and the St Peters Community Pre-school for consideration of additional noise mitigation during the daytime only.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken to meet the project noise requirements.

Further detail on the assessment of potential impacts to receivers is provided in Section 12.4.2 and Appendix J (Technical working paper: Noise and vibration) of the EIS. The operational road traffic

noise assessment was completed in accordance with the RNP and Roads and Maritime's NCG and Noise Mitigation Guideline.

An assessment of operational facilities or 'fixed' facilities was undertaken in accordance with the *Industrial Noise Policy* (EPA, 2000). This assessment found that the fixed facilities would comply with the applicable noise criteria at the most affected residential receivers.

Issue description – impacts on receivers adjacent to Euston Road

Submissions expressed concern with the potential traffic noise impacts on receivers adjacent to Euston Road north of the intersection with Sydney Park Road as a result of the realignment works along this section of Euston Road.

Response

Section 12.4.2 and Appendix J of the EIS provide an operational noise assessment for the project, including an assessment of potential traffic noise. The operational road noise assessment has been carried out in accordance with the *Noise Criteria Guideline* (RMS, 2015). The guideline provides guidance on how to implement the *NSW Road Noise Policy* (DECCW, 2011) for Roads and Maritime projects. This assessment considered the potential increase in operational traffic noise and feasible and reasonable management measures where receivers were anticipated to experience traffic noise impacts above applicable assessment criteria.

There are two residential receiver locations on the western side of Euston Road, between Sydney Park Road and Maddox Street, and these were considered in the operational traffic noise assessment:

- Receiver location 1629, being the medium density residential apartment building complex along street frontage 93-103 Euston Road
- Receiver location 1984, being the medium density residential apartment building complex along street frontage 123-125 Euston Road.

In 2021, without the project, night time road traffic noise levels at these two locations are expected to reach 71 dB(A) and 72 dB(A) respectively (as $L_{Aeq(9\text{-}hour)}$). These noise levels exceed the assessment criterion for a redeveloped road (55 dB(A) at night), indicating that elevated traffic noise is an issue for these receivers, even if the New M5 project is not built.

With the project in 2021 it is anticipated that night time traffic noise would increase at both receivers to 74 dB(A) (+2.8dB(A) and +1.7 dB(A), respectively).These anticipated increases in road traffic noise may be minor in relative terms, but are noteworthy in the context of existing elevated road traffic noise along Euston Road (without the project).

Consistent with the NCG and the RNP these receiver locations have been identified as eligible for consideration of at-property acoustic treatment to minimise road traffic noise impacts. This would be confirmed during detailed design.

Section 12.5.2 of the EIS (as amended in **Chapter 8** (Revised summary of environmental management measures) of this report) describes applicable at-property acoustic treatments for these groups. The requirement for at-property treatment would be finalised during detailed design, following property inspections as required.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken.

Issue description – noise prediction clarifications around St Peters interchange

Submissions have raised concerns that increased noise from project operation would affect residential properties in the vicinity of the St Peters interchange, including Campbell Street and Campbell Road and St Peters Public School.

Response

The operational road noise assessment has been carried out in accordance with the *Noise Criteria Guideline* (RMS, 2015). The guideline provides guidance on how to implement the *NSW Road Noise Policy* (DECCW, 2011) for Roads and Maritime projects.

For the area around the St Peters interchange and the local road upgrades the night-time period was the more stringent noise assessment period. Road traffic noise levels at a total of 145 residential sensitive receivers exceeded the $L_{Aeq(9hour)}$ noise criterion. In accordance with the *Noise Mitigation Guideline* (RMS, 2015) it was not reasonable to consider additional noise management measures at receivers that would experience an increase in road traffic noise levels of 2 dB(A) or less, and which were not considered 'acute'. As such a total of 144 residential receivers were considered for additional noise management measures. In addition, one school building at St Peters Public School and the St Peters Community Pre-school are eligible for consideration of noise management measures during the day time (ie when they are occupied).

Around the St Peters interchange, some receivers would be eligible for consideration of at-property acoustic treatments. Each property would be inspected at the detailed design stage and noise mitigation provided where appropriate, in accordance with the *Noise Mitigation Guideline* (RMS, 2015). The recommended management measures would ensure that the levels of road traffic noise experienced by residents would be reduced as low as feasible and reasonable. The requirements and the form of noise mitigation would be confirmed during detailed design.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken to meet the applicable predicted levels.

The redistribution of traffic is not an acoustic consideration and is therefore beyond the scope of the Technical working paper: Noise and vibration (Appendix J of the EIS).

Issue description – noise predictions along Campbell Street and Unwins Bridge Road at St Peters

Given that all the additional traffic on Campbell Street is going to either go straight onto Bedwins Road / Edgeware Road, or left onto Unwins Bridge Road, it is simply not feasible that the traffic noise increase on Unwins Bridge Road is 1 dB(A).

The operational noise impacts for residents on Unwins Bridge Road, and the southern end of Brown Street are likely to have Unwins Bridge Road as their dominant noise source, and are likely to experience an increase in noise of more than 2 dB(A).

Response

The current road traffic volumes on Campbell Street / Campbell Road are relatively low when compared to the future predicted road traffic volumes. Although road traffic volumes would also increase on Unwins Bridge Road and Bedwin Road, the relative increases in road traffic volumes are significantly lower than Campbell Street. Therefore the increase in noise is also much less. Road traffic noise levels are predicted to decrease for Edgeware Road due to traffic switching from Bedwin Road to Edinburgh Road.

In addition, on Campbell Street / Campbell Road buildings are being removed which currently provide shielding of more than 10 dB(A) to the most affected sensitive receivers. Removal of these buildings would remove the shielding and contribute to predicted noise levels at other receiver locations. This effect is in addition to additional traffic noise contributions. The effect of removing existing shielding is not experienced to the same degree (and in most cases, not all) along other roads.

It is relevant to note that Campbell Street would also be located closer to receivers as a result of the project.

These three factors have resulted in increases in traffic noise along Campbell Street / Campbell Road appreciably greater than along surrounding roads.

Road traffic noise levels for all affected receivers located on Brown Street are available in Appendix J of the EIS (Technical working paper: Noise and vibration). Receivers at the southern end of Brown Street were calculated to be more affected by road traffic on Unwins Bridge Road than by road traffic on Campbell Street. Noise levels in this area were assessed and found not to be affected by the project (noise levels from project roads would not increase noise levels by more than 2 dB(A)) and were therefore not assessed further.

Issue description – noise predictions at Brown Street at St Peters

Submissions requested clarification of the operational noise predictions for residential receivers at 9 Brown Street at St Peters.

Response

Appendix L in the Technical working paper: Noise and vibration (Appendix J of the EIS) includes maps that show the modelled operational noise levels as a result of the project in 2021 and 2031, as well as the anticipated change in noise levels relative to the 'without project' scenario. In relation to 9 Brown Street at St Peters, the maps show that:

- Noise during the day time is anticipated to be around 58-60 dB(A) ($L_{Aeq(15\ hour)}$) and around 53-55 dB(A) during the night time ($L_{Aeq(9\ hour)}$) in 2021
- Noise during the day time is anticipated to be around 56-58 dB(A) ($L_{Aeq(15\ hour)}$) and around 53-55 dB(A) during the night time ($L_{Aeq(9\ hour)}$) in 2031.

Issue description – noise prediction clarifications at Campbell Street at St Peters

Submissions requested clarification of the operational noise predictions for residential receivers at 34 Campbell Street at St Peters.

Response

The property at 34 Campbell Street at St Peters would be demolished as part of the project. As such, this property has not been included in the noise assessment for the project.

Issue description – surface noise from vehicles using the tunnel below receivers

Submissions queried whether traffic noise generated in the tunnel would impact on receivers at the surface.

Response

The operational noise assessment for the project is presented in Chapter 12 and Appendix J (Technical working paper: Noise and vibration) of the EIS.

Traffic using the project tunnels would generate noise which can 'break out' from the tunnel portals. This effect has been taken into account in the modelling and assessment of operational noise impacts from the project.

Issue description – control measures for increased traffic noise

Submissions have raised concerns that the EIS did not consider measures to address noise impacts and that any identified measures would be technically and politically difficult to implement.

Response

Where possible, the project has been designed and planned to avoid and minimise operational noise impacts.

Section 12.5.2 of the EIS provides details on the mitigation and management measures which would be implemented to address operational noise impacts. A summary of these measures is included below. Options to mitigate road traffic noise include the following (in order of priority):

- At-source mitigation, including choice of quieter road pavement
- Noise attenuation using noise barriers

- At-receiver noise mitigation, including at-property acoustic treatments.

When considering road traffic noise mitigation and management measures, it is important to appreciate the key sources of noise to provide a focus for considering feasible and reasonable measures.

At-source mitigation

The project has been designed to include the following pavement types:

- Dense graded asphalt at the St Peters interchange and local road upgrades
- Open graded asphalt for the main alignment tunnels, on and off ramps and M5 East Motorway integration works.

Dense graded asphalt is commonly used for arterial and other major roads, and provides a durable, relatively long wearing road surface. Dense graded asphalt is appropriate for application to medium to high speed roads.

Open graded asphalt has been selected for the motorway components of the project, principally based on its performance as a high speed road surface. It is typically more costly than dense graded asphalt, but provides better skid reduction properties, particularly in wet weather conditions. Open graded asphalt also generates lower road pavement noise than dense graded asphalt, by around 2 dB(A) to 3 dB(A).

Noise attenuation using noise barriers

Existing noise barriers along the western surface works area would be retained or relocated outside the project's construction and operational footprints, at an equivalent height with the exception of the noise berm south at Beverly Grove Park. The noise barriers would be relocated as early as practicable during the construction phase of the project to provide ongoing noise attenuation during construction and operation.

Despite the presence of noise barriers, one residential receiver would be likely to experience road traffic noise above the cumulative limit (ie $L_{Aeq(9\ hour)}$ noise criterion + 5 dB(A)). This is despite the receiver experiencing a net reduction in road traffic noise with project implementation, relative to existing road traffic noise levels, of around 1.1 dB(A). This receiver location is considered eligible for further consideration of feasible and reasonable noise mitigation measures.

The potential application of noise barriers around the St Peters interchange and local road upgrades area has been considered, taking into account that the principal source of road traffic noise to be mitigated in this area relates to local road upgrades (rather than the St Peters interchange).

Installation of noise barriers along the local road upgrade works may be feasible, but is considered not to be reasonable for the following reasons:

- The noise barriers would need to be installed along street frontages, which would either completely block direct street access to and from adjacent properties, or would be ineffective due to the presence of gaps in the noise barriers to allowed continued street access
- The proximity of noise barriers to residential receivers would likely generate an unacceptable urban design, visual amenity and overshadowing impact
- The location and extent of noise barriers that would be required would likely contribute to unacceptable land use outcomes, through severance and isolation of both residential and public open space areas
- The noise barriers would require additional land take, including acquisition of residential land to install the barriers.

At-property acoustic treatments

At-property acoustic treatment would be considered at each of the properties eligible for consideration of feasible and reasonable noise mitigation (refer to Section 5.1 of the Technical working paper: Noise and vibration (Appendix J of the EIS) for a list of these properties). In addition, at one building at the St Peters Public School and the neighbouring St Peters pre-school during the daytime only. The

number of receiver locations eligible for consideration of feasible and reasonable noise mitigation would be confirmed during detailed design, including further operational road traffic noise assessment where required. Confirmation receivers eligible for consideration of at-property acoustic treatment may result in minor changes to the number and location of receivers.

Each property would be inspected at the detailed design stage and noise mitigation provided where appropriate, in accordance with the Noise Mitigation Guideline. The recommended management measures would ensure that the levels of road traffic noise experienced by residents would be reduced. The requirements and the form of noise mitigation would be confirmed when assessed against the detailed design.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken to meet the applicable predicted levels.

Section 12.4.2 and Appendix J of the EIS provide an operational noise assessment for the project, including an assessment of potential traffic noise. The operational road noise assessment has been carried out consistent with the SEARs for the project, and in accordance with the *Noise Criteria Guideline* (RMS, 2015) and *Noise Mitigation Guideline* (RMS, 2015), which provides guidance on the implementation of the *NSW Road Noise Policy* (DECCW, 2011) for Roads and Maritime projects. This assessment considered the potential increase in operational traffic noise and feasible and reasonable management measures where receivers are anticipated to experience traffic noise impacts above applicable assessment criteria.

Issue description – signalised pedestrian crossings

A submission requested information regarding how the noise generated at upgraded intersections, including by signalised pedestrian crossings to assist vision impaired persons to cross, would be mitigated for residents living close to upgraded intersections around St Peters.

Response

Where possible, the project has been designed and planned to avoid and minimise operational noise impacts. The Roads and Maritime policy *Management of noise from traffic control signal audio-tactile push buttons* outlines the framework for assessing noise levels from traffic control signal audio-tactile pedestrian push buttons.

Audible tactile devices at pedestrian crossings to assist vision impaired persons would be designed and installed to meet the requirements of Australian Standard *AS2352-1999 Pedestrian Push-button Assemblies*. The Australian Standard species a reference level for audible locating signals as a sound power level of 71 ±3 dB(A).

Because audible tactile devices are an important measure to ensure the safety of vision impaired persons, and in most cases the location of pedestrian crossings is fixed, there are limited opportunities for noise attenuation or mitigation for these types of pedestrian signals. Notwithstanding, opportunities to locate signals to minimise potential impacts on surrounding receivers would be considered during detailed design.

5.10.16 Operational vibration

Nine submitters have raised issues regarding operational vibration.

Issue description – 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).

Response

Vehicles using the project tunnels during operation would not generate vibration transmitted through the tunnel and overlying rock at levels likely to lead to vibration or ground-borne impacts at the surface. This is because:

- Vehicles would generate relatively low intensity vibration, particularly relative to other project scenarios such as the use of road headers during construction tunnelling
- The road pavement wearing course 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. By comparison, the more vibration intensive use of road headers for construction tunnelling only result in elevated ground-borne noise levels around tunnel portals and shallower sections of the project tunnels (reflecting the effect of deep tunnel locations and attenuation through significant rock depths).

5.10.17 Provision and location of noise barriers

43 submitters have raised issues in relation to the provision and location of noise barriers.

Issue description – noise berm south of Beverly Grove Park

Submissions suggested that the existing noise berm located at the southern end of Beverly Grove Park at Kingsgrove should be replaced with a new noise berm instead of a noise wall, even where it is acknowledged that this may result in a loss of some open space at this location.

Submissions stated the proposal to replace the noise mound with a transparent noise mound would be unacceptable as receivers around this location do not want to see traffic passing by houses and parkland.

Submissions recommended that the noise wall be opaque and that landscape plantings be used at this location to protect the current amenity of the area.

Response

An existing noise berm (noise mound) is currently located at the southern extent of Beverly Grove Park at Kingsgrove. As described Section 8.1.2 of the noise and vibration impact assessment in Appendix J of the EIS, this noise berm must be removed to facilitate the new road alignment.

As the revised road alignment results in the road moving further north when compared to its current alignment, relocation and replacement of the existing noise berm would result in a significant impact on the area of open space in this location (effectively eliminating usable park area). During additional consultation, most community members expressed a strong preference for maintaining useable park area in this location and for this reason two alternatives to relocation and replacement of the existing noise berm have been considered:

- A noise barrier (noise wall)
- A smaller noise berm combined with a noise barrier (noise wall).

Confirmation of whether noise mitigation at this location be a noise barrier or a combined noise berm and noise barrier, including consideration of landscaping and the visual impact of the proposed options, would be undertaken during the detailed design stage of the project and in consultation with the local community.

Issue description – request for a noise barrier at multiple locations

Submissions have raised general and specific concerns that there are a lack of noise barriers proposed adjacent to the project in general, and requested the provision of noise barriers at a number of locations (listed below).

Submissions also questioned the adequacy of the assessment regarding noise barriers for the local road upgrades at St Peters, and called for further assessment and requested that consideration be given to the use of noise barriers even where their effectiveness may be impaired by gaps required for providing access to side streets.

Specific locations where noise barriers were requested included:

- At a number of locations along Campbell Street / Campbell Road, including on the western side of the Princes Highway and St Peters Street
- Recommendation that the proposed car parking on Campbell Street eastbound be replaced with a noise barrier, which would assist in minimising noise impacts to Simpson Park.

Submissions requested that appropriate protection be afforded to sensitive receivers via noise barriers during both the construction and operation of the project and that the design of noise barriers have regard to the aesthetic of the location in which they are to be installed.

Response

Noise mitigation has been designed in full accordance with the RMS noise criteria guideline and noise mitigation guideline.

Where the consideration of noise mitigation has been triggered feasible and reasonable management measures in the following order should be considered.

- Road design and traffic management
- Quieter pavement surfaces
- In-corridor noise barriers / mounds
- At-property treatments or localised barriers / mounds.

Western surface works

Existing noise barriers along the western surface works area would be retained or relocated outside the project's construction and operational footprints, at an equivalent height with the exception of the noise berm south at Beverly Grove Park. The noise barriers would be relocated as early as practicable during the construction phase of the project to provide ongoing noise attenuation during construction and operation. The presence of noise barriers has been included in the operational traffic modelling and assessment conducted for the western surface works area.

St Peters interchange and local roads

For Campbell Street residences incorporating a low-noise pavement would have had negligible noise reductions due to low traffic speeds in the area. As traffic slows the noise reduction provided by low-noise pavements significantly reduce. In the future these roads would be dominated by start-stop traffic that where engine noise rather than tyre noise becomes a more appreciable noise source.

The potential application of noise barriers around the St Peters interchange and local road upgrades area has been considered, taking into account that the principal source of road traffic noise to be mitigated in this area relates to local road upgrades (rather than the St Peters interchange). Although noise barriers would be feasible within the St Peters interchange site, they are unlikely to make a significant difference to predicted road traffic noise levels at residential receiver locations or at the St Peters Public School. This is due to the elevated noise source at the St Peters interchange, which would be above the height at which a noise barrier could be practically constructed. The use of noise barriers to mitigate noise from the St Peters interchange would therefore not be reasonable. A noise barrier was not considered appropriate adjacent to Simpson Park based on land take, visual amenity and overshadowing impacts.

Installation of noise barriers along the local road upgrade works may be feasible, but is considered not to be reasonable for the following reasons:

- The noise barriers would need to be installed along street frontages, which would either completely block direct street access to and from adjacent properties, or would be ineffective due to the presence of gaps in the noise barriers to allowed continued street access
- The proximity of noise barriers to residential receivers would likely generate an unacceptable urban design, visual amenity and overshadowing impact
- The location and extent of noise barriers that would be required would likely contribute to unacceptable land use outcomes, through severance and isolation of both residential and public open space areas

- The noise barriers would require additional land take, including acquisition of residential land to install the barriers.

The use of noise barriers to mitigate road traffic noise around the local road upgrades would not provide a reasonable or appropriate noise mitigation outcome.

It was not deemed possible to develop noise barrier and mounds and maintain access to the local street such as Brown Street and Florence Street. Closing the Campbell Street entrance would limit access via Conway Place and Silver Street. Access to Brown Street and Florence Street needs to be maintained to allow appropriate road network connectivity and accessibility. All roads connecting to Campbell Street would have needed to be terminated. Providing short noise barriers that ran between streets would have resulted in very limited noise reductions as the noise would still have propagated down the open streets. As such the only remaining noise mitigation available to the project was to install architectural treatment.

Around St Peters interchange, receivers are eligible for the consideration of the provision of architectural treatments (refer to Section 8.2 of the Technical working paper: Noise and vibration at Appendix J of the EIS for a list of eligible receivers). Section 12.5.2 of the EIS (as amended in **Chapter 8** (Revised summary of environmental management measures) of this report) describes applicable at-property acoustic treatments for these receivers. The requirement for at-property treatment would be finalised during detailed design, following property inspections as required.

Further work would be undertaken during the detailed design stage of the project to confirm any noise mitigation that would be incorporated in the design of the project. All noise mitigation would need to be considered at this stage, including low-noise pavements and noise barriers.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken to meet the applicable predicted levels.

Issue description – noise barriers along Campbell Street

Submissions requested that consideration be given to making Brown Street and Florence Street at St Peters a cul-de-sac at Campbell Street at St Peters and installing a noise barrier at this location.

Response

It was not deemed possible to install noise barrier and noise mounds, while also maintaining adequate access to streets such as Brown Street and Florence Street. Closing the Campbell Street entrance would limit access via Conway Place and Silver Street. Access to Brown Street and Florence Street needs to be maintained to allow appropriate road network connectivity and accessibility. Providing short noise barriers that ran between streets would have resulted in very limited noise reductions as the noise would still have propagated down the open streets.

Around St Peters interchange, receivers are eligible for the consideration of the provision of architectural treatments (refer to Section 8.2 of the Technical working paper: Noise and vibration at Appendix J of the EIS for a list of eligible receivers). Section 12.5.2 of the EIS (as amended in **Chapter 8** (Revised summary of environmental management measures) of this report) describes applicable at-property acoustic treatments for these receivers. The requirement for at-property treatment would be finalised during detailed design, following property inspections as required.

Further work would be undertaken during the detailed design stage of the project to confirm any noise mitigation that would be incorporated in the design of the project.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken to meet the applicable predicted levels.

Issue description – noise barriers along Euston Road

Submissions requested that consideration be given to making Brown Street and Florence Street at St Peters a cul-de-sac at Campbell Street at St Peters and installing a noise barrier at this location.

Response

It was not deemed feasible to install noise barrier and noise mounds, while also maintaining adequate access to local streets such as Brown Street and Florence Street. Closing the Campbell Street entrance would limit access via Conway Place and Silver Street. Access to Brown Street and Florence Street needs to be maintained to allow appropriate road network connectivity and accessibility. Providing short noise barriers that run between streets would have resulted in very limited noise reductions as the noise would still have propagated down the open streets.

Around St Peters interchange, receivers are eligible for the consideration of the provision of architectural treatments (refer to Section 8.2 of the Technical working paper: Noise and vibration at Appendix J of the EIS for a list of eligible receivers). Section 12.5.2 of the EIS (as amended in **Chapter 8** (Revised summary of environmental management measures) of this report) describes applicable at-property acoustic treatments for these receivers. The requirement for at-property treatment would be finalised during detailed design, following property inspections as required.

Further work would be undertaken during the detailed design stage of the project to confirm any noise mitigation that would be incorporated in the design of the project.

Operational traffic noise would be monitored within 12 months of commencement of operation of the project. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken to meet the applicable predicted levels.

Issue description – removal of noise barriers at Beverly Hills / Kingsgrove

Submissions expressed concern that the removal of existing noise barriers at the western end of the project would result in noise impacts to nearby receivers.

Submissions contended that the impact of combined night noise levels from night construction works, excavation, spoil removal and existing traffic that would be exposed by the removal of the existing earth noise barriers have not been modelled sufficiently. Nor is there any definition of what constitutes feasible and reasonable management strategies and who is responsible for their determination. Given the heavy burden on residents adjacent the western surface works (Kingsgrove North construction compound (C1)), local representation must be included before the project approval.

Response

Existing noise barriers along the western surface works area would be retained or relocated outside the project's construction and operational footprints, at an equivalent height with the exception of the noise berm south at Beverly Grove Park. The noise barriers would be relocated as early as practicable during the construction phase of the project to provide ongoing noise attenuation during construction and operation. The presence of noise barriers has been included in the operational traffic modelling and assessment conducted for the western surface works area. Consultation is underway with local residents and businesses in the immediate area and would continue throughout detailed design.

Mitigation of noise generated from the Kingsgrove North construction compound (C1) would include:

- A 2.5-metre high noise barrier along the northern and eastern boundaries of the construction compound
- An acoustic shed covering the tunnel construction shaft and associated spoil stockpile area.

The construction noise impact assessment for the project identified that additional noise mitigation may be feasible and reasonable for the Kingsgrove North construction compound (C1), and these potential management measures would be further considered during detailed design. Potential management measures that may be identified as feasible and reasonable following more detailed consideration include:

- Additional height for the noise barrier to be installed along the northern and eastern boundaries of the construction compound

- Temporary noise barriers to mitigate construction noise impacts while existing noise barriers are relocated.

The concepts of 'feasible' and 'reasonable' are defined in the *Noise Mitigation Guideline* (RMS, 2015) as follows:

- 'Feasible' relates to engineering considerations (what can be practically built). These engineering considerations may include:
  - The inherent limitations of different techniques to reduce noise emissions from road traffic noise sources
  - Safety issues such as restrictions on road vision
  - Road corridor site constraints such as space limitations
  - Floodway and stormwater flow obstruction
  - Access requirements
  - Maintenance requirements
  - The suitability of building conditions for at-property treatments.
- 'Reasonable' relates to selecting reasonable measures from those that are feasible. It involves judging whether the overall noise benefits provide significant social, economic or environmental benefits. The factors to be considered are:
  - The noise reduction provided and the overall number of people that benefit from the mitigation
  - Existing and future noise levels, including changes in noise levels in the build and design year and the extent of any exceedance of the noise criteria
  - Potential for a management measure to reduce noise during construction as well as from road traffic after the project is complete
  - The cost of mitigation, including the cost of noise management measures as a percentage of the total project cost and the ongoing maintenance and operational costs
  - Community views and wishes (typically gathered at a number of stages including route selection, following concept design, community consultation process following the noise assessment and post opening in the operational noise report)
  - Visual impacts for the community surrounding the road project and for road users. These are typically identified in the environmental impact assessment
  - The wider community benefits arising from noise mitigation of the proposed road or road redevelopment
  - Relative weighting of treatments with respect to protection of outdoor areas or only internal living spaces.

Issue description – noise attenuation

Submissions queried how noise attenuation had been incorporated into options for noise mitigation, such as ensuring the nearest houses are at an adequate distance to achieve the noise attenuation effect and compliance with acceptability criteria.

Response

Whilst the distance attenuation from a single vehicle is 6 dB(A) per doubling of distance, a busy road acts as an acoustic line source and reduces by only 3 dB(A) per doubling of distance. Significant distances would be required to reduce road traffic noise to the NSW Road Noise Policy criteria and this is not considered feasible in the existing urban environment. Noise mitigation options have taken the above into account and will be further developed during detailed design.

5.10.18 At-property acoustic treatment

95 submitters have raised issues regarding the provision of at-property acoustic treatment for properties likely to experience impacts.

Issue description – at-property acoustic treatment – eligibility

Submission were received which questioned whether only the ground and first floors of buildings would be eligible for at-property treatment.

Response

Roads and Maritime would give consideration to at-property acoustic treatments to all levels of multistorey residential dwellings exceeding Road Noise Policy assessment criteria. This consideration would include a feasible and reasonable review of at-property treatments during detailed design to confirm the effectiveness of any treatments in reducing noise.

Issue description – at-property acoustic treatment – types

A submission queried why the Roads and Maritime fact sheet 'Managing traffic noise from new and upgraded roads' on its website offers window glazing and air-conditioning where SMC is only offering fresh air ventilation and sealing of windows.

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 5.1 of the Technical working paper: Noise and vibration (Appendix J of the EIS) for a list of these properties), at the St Peters Public School and neighbouring pre-school. The number of receiver locations which require further consideration of noise mitigation would be confirmed during detailed design, including further operational road traffic noise assessment where required.

Where a receiver is confirmed during detailed design as being eligible for consideration of at-property acoustic treatment, further consultation with the affected landowner would be carried out. This would include inspection of the property and discussion with the landowner about the types of acoustic treatment that could be reasonably applied to the property. Broadly, two categories of at-property treatments would be considered:

- Type 1 – for exceedances of up to 10 dB(A), at-property treatments may include fresh air ventilation, sealing of wall vents and upgrading door and window seals
- Type 2 – for exceedances of more than 10 dB(A), at-property treatments may include the treatments listed for Type 1 above, plus additional upgrades to windows and doors.

Issue description – potential impacts at St Peters Public School

Where open grade pavement and noise barriers would not be used around the St Peters interchange, the proposed property treatment is likely to include measures such as double glazing and / or fresh air ventilation which would result in school children having to be shut up in closed window classrooms to meet the criteria and residential receivers having to keep doors and windows closed to avoid noise impacts.

There would be no way to mitigate the operational noise impacts for school children and residents during outdoor periods.

Response

Feasible and reasonable noise management measures have been identified and proposed, in accordance with the *NSW Road Noise Policy* (DECCW, 2011) the *Noise Criteria Guideline* (RMS, 2015) and the *Noise Mitigation Guideline* (RMS, 2015).

Where the consideration of noise mitigation has been triggered, feasible and reasonable management measures in the following order have been considered:

- Road design and traffic management

- Quieter pavement surfaces
- In-corridor noise barriers / mounds
- At-property treatments or localised barriers / mounds.

Section 6.1.9 of the Technical working paper: Noise and vibration (Appendix J of the EIS) states that outdoor noise levels are up to $L_{Aeq(1hour)}$ 55dB(A) at St Peters Public School outdoor areas, including playgrounds. This complies with the RNP criterion level for passive recreation.

Issue description – potential impacts to outdoor space

Submitters expressed concerns that at-property acoustic treatment would not alleviate impacts on outdoor space, including local streets, local parks and at the St Peters preschool.

Response

Feasible and reasonable noise management measures have been identified and proposed, in accordance with the *NSW Road Noise Policy* (DECCW, 2011) the *Noise Criteria Guideline* (RMS, 2015) and the *Noise Mitigation Guideline* (RMS, 2015).

Where the consideration of noise mitigation has been triggered, feasible and reasonable management measures in the following order have been considered:

- Road design and traffic management
- Quieter pavement surfaces
- In-corridor noise barriers / mounds
- At-property treatments or localised barriers / mounds.

For Campbell Street residences, incorporating a low-noise pavement would have resulted in negligible noise reductions due to low traffic speeds in the area. As traffic slows the noise reduction provided by low-noise pavements is significantly reduced.

A noise barrier was not considered appropriate adjacent to Simpson Park based on land take, visual amenity and overshadowing impacts. As such the only remaining noise mitigation available to the project was to consider installation of at-property acoustic treatments.

The EIS identified two school buildings at the St Peters Public School as being eligible for consideration of noise mitigation during the daytime only. One of these buildings is in fact the St Peters Community Pre-school (with frontage at 18 St Peters Street at St Peters and Church Street). This incorrect description has been clarified in **Chapter 6** of this report. This clarification does not alter the outcome of the assessment or recommendations.

Further analysis would be undertaken at the detailed design stage to determine the exact nature of any applicable noise mitigation.

Issue description – potential impacts at Gardeners Road

Submissions requested additional detail regarding at-property acoustic treatment for residential receivers at 635 Gardeners Road at Mascot, including:

- Noise level predictions at receivers following the completion of at-property acoustic treatment
- Timing of the at-property acoustic treatment
- Confirmation of consultation with receivers.

Response

A full list of residential receivers for which further consideration of feasible and reasonable noise management measures is required is provided in Section 8.2.1 of the Technical working paper: Noise and vibration (Appendix J of the EIS). One property at 635 Gardeners Road at Mascot has been identified as being eligible for consideration of at-property acoustic treatment to achieve compliance with the applicable noise goals. This would be confirmed during 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 would be carried out. This would include inspection of the property and discussion with the landowner about the types of acoustic treatment that could be reasonably applied to the property and the timing of these works. Broadly, two categories of at-property treatments would be considered:

- Type 1 – for exceedances of up to 10 dB(A), at-property treatments may include fresh air ventilation, sealing of wall vents and upgrading door and window seals
- Type 2 – for exceedances of more than 10 dB(A), at-property treatments may include the treatments listed for Type 1 above, plus additional upgrades to windows and doors.

Issue description – potential impacts from St Peters interchange

Submitters expressed concerns that at-property acoustic treatment was proposed for receivers around the St Peters interchange, and that other management measures were not proposed.

Response

Feasible and reasonable noise management measures have been identified and proposed, in accordance with the *NSW Road Noise Policy* (DECCW, 2011) the *Noise Criteria Guideline* (RMS, 2015) and the *Noise Mitigation Guideline* (RMS, 2015).

Where the consideration of noise mitigation has been triggered feasible and reasonable management measures in the following order have been considered:

- Road design and traffic management
- Quieter pavement surfaces
- In-corridor noise barriers / mounds
- At-property treatments or localised barriers / mounds.

Noise mitigation through road design and traffic management were considered for Campbell Street however, these were considered to be unfeasible due to physical constraints within the highly urban area. Quieter pavements do not provide significant reductions in road traffic noise where the road traffic is not free-flowing and achieving steady speeds of around 50 kilometres per hour.

In-corridor noise barriers / mounds were not found to be feasible due to access and space constraints. Therefore it was recommended that at-property treatments be considered.

5.10.19 Noise impacts from operational ancillary facilities

Two submitters raised noise impacts associated with the operation of ancillary facilities to the project.

Issue description – ventilation systems

A submission raised general concerns with the potential impacts from continuous noise from the ventilation systems at the tunnel portals.

Response

The applicable operational noise criteria, as derived in accordance with the *Industrial Noise Policy* (EPA, 2000) would not be exceeded during neutral or adverse weather conditions for noise resulting from the operation of fixed facilities including the ventilation facilities. This would be the case during normal traffic conditions and low speed traffic conditions.

The predicted noise levels at the most affected receiver for each facility are presented in Table 104 to Table 109 of the Technical working paper: Noise and vibration (Appendix J of the EIS). Further information regarding how the assessment of noise impacts from the operation of the fixed facilities (including the ventilation facilities) associated with the project was conducted is provided in Section 6.2 of the Technical working paper: Noise and vibration (Appendix J of the EIS).

5.10.20 Cumulative noise impacts during operation

Nine submitters have raised issues regarding cumulative noise impacts during the operation of the project.

Issue description – WestConnex contributions to cumulative noise impacts

St Peters already has many contributors to noise pollution (aeroplane, train and road traffic). The introduction of WestConnex would only add to this as a larger noise source.

The assessment does not consider the potential cumulative noise impacts associated with possible future expansion of the Sydney Airport.

Response

The existing background noise levels (rating background levels) used to forecast construction and operational noise impacts from the project have been established via a background noise monitoring campaign described in Section 12.2 of the EIS. This background noise monitoring data includes noise contributions from other existing noise sources.

The dominant existing sources of noise around the project include the M5 East Motorway, Bexley Road, Kingsgrove Road, King Georges Road, the Princes Highway, Canal Road and Campbell Road. There are also noise contributions from local roads. The existing noise environment within the study area is generally dependent on the proximity of receiver location to existing major road corridors. Other key noise sources in the study area include the East Hills, Airport, Inner West and Illawarra Railways and Sydney Airport.

The operational noise assessment undertaken as part of the project included an assessment of 2031 traffic volumes, which included the cumulative noise impacts of vehicles using WestConnex when all projects are completed.

The operational noise assessment also takes into account contributions from approved or confirmed major projects. An expansion of the Sydney Airport is not an approved or confirmed project.

5.11 Human health

5.11.1 Assessment methodology

70 submitters raised issues regarding the methodology of the human health risk assessment.

Issue description – level and quality of human health risk assessment

Submissions raised concern over the level, quality and scope of the human health risk assessment. Specific concerns included:

- Perceived failure to consider negative impacts of the WestConnex program of works including costs to human health
- Assumptions used in air quality, traffic noise and vibration modelling were inadequate for an assessment of impacts on human health
- Modelling should include the indirect costs of the impact on health
- The way in which the existing health of local people was taken into consideration
- Limited information provided for impacts on health and safety
- Assessment of impacts on the health of inner city residents was insufficient
- Assessment of the impacts on the residents of Edgeware Road and surrounding local roads
- Not all pollutants have been included in the assessment of human health (in particular health impacts of metals of carbonyl compounds)
- Failure to meet the SEARs, specifically how the design (relative to other design options) minimises health impacts

- In-tunnel concentration data is provided as maximum one-hour average levels, however, the in-tunnel criteria used to judge potential for health impacts are related to shorter averaging times – comparing the two is considered inappropriate
- Multiple suburbs were combined within the report, concerned that this may obscure potential health impacts for different areas
- Limited assessment of carcinogens and impacts
- Chapter 11 of the EIS should quantify and consider the cumulative risk to health from air quality and noise sources.

Response

Consideration of impacts to human health

The risk based assessment methodology used to assess the potential health risks of the project is in accordance with national and international practices that have been endorsed and accepted by Australian health and environmental authorities as detailed in Section 3 of Appendix I (Technical working paper: Human health risk assessment) of the EIS. The assessment considers in detail the human health risks and costs associated with the project, including those associated with air quality, noise and vibration as well as social impacts during the construction and operation of the project, and an estimation of short-term (acute) and long-term (chronic) impacts during construction and operation of the project

Air quality, traffic noise and vibration modelling assumptions and impacts on human health

The air quality impact assessment carried out for the project, Appendix H (Technical working paper: Air Quality) of the EIS, and on which the air quality aspects of the human health risk assessment has been based includes consideration of impacts from the New M5 in isolation, as well as a cumulative impact scenario. This cumulative impact scenario for 2031 included the full WestConnex program of works, the Sydney Gateway and the Southern Connector (formerly the Southern extension). Table 11-12 in the EIS presents the calculated individual health risks associated with changes in PM_{10} and $PM_{2.5}$ levels in the cumulative scenario in 2031. Most of the calculated individual risks are in the range $2x10^{-7}$ to $1x10^{-4}$ and are considered to range from negligible to tolerable / acceptable.

The project is expected to result in a reduction in total pollutant levels in the community. This reduction in pollutant levels is a result of the combined effects of traffic redistribution, reduced congestion (leading to lower vehicle emissions) and more effective dispersion of vehicle emissions through operation of the project's ventilation systems.

For much of the community, there would either be no change or a small improvement in air quality, leading to no change or a slight reduction in human health risks. This would include those residents along Edgeware Road and surrounding local roads, and residents in the inner city (within the CBD and surrounding suburbs). However in some areas adjacent to major roads and some local road upgrades in St Peters a small increase in pollutant levels may occur. The potential human health risks associated with these increases within the local community, specifically as a result of exposures to nitrogen dioxide and particulate matter, have been assessed and are considered to be acceptable.

In relation to noise and vibration, potential impacts during construction and vibration have been considered. The assessment concluded that during construction, without implementation of management measures there is the potential for noise and vibration impacts associated with a range of construction activities to result in adverse health effects in the community. Feasible and reasonable environmental management measures have been developed to manage these potential impacts Further detail is provided in **Section 5.11.7** and **Chapter 8** of this report.

Information for impacts on health and safety

The Technical working paper: Human health also assessed impacts resulting from changes in the urban environment associated with the project on health and wellbeing of the community.

Positive benefits would include reduced peak traffic along the M5 East Motorway corridor and on local roads around St Peters, increased public open space following the closure of Alexandria Landfill and improvements in pedestrian and cycle access in some areas following completion of construction.

Negative impacts may occur as a result of traffic changes during construction, property acquisitions, visual changes, noise impacts and changes in access / cohesion of local areas. These may result in increased levels of stress and anxiety. In many cases the impacts identified are either short-term (associated with construction only) and / or mitigation / management measures have been identified to minimise the impacts on the community.

Available statistics in relation to the existing health status of the existing community are presented in the Technical working paper: Human health risk in Appendix I of the EIS.

Assessment of impacts on residents of specific local roads

The assessment does not evaluate the overall health status of the community or any individuals. Rather, it locally calculates and compares potential exposure in areas associated with the project, with regulatory and published acceptable air levels that any person may be exposed to over a lifetime without unacceptable risk to their health. It can also involve calculating an incremental impact that can be evaluated in terms of an acceptable level of risk.

Pollutants included in the assessment of human health

The SEARs required assessment of potential emissions of PM_{10}, $PM_{2.5}$, CO, NO_2, other nitrogen oxides and volatile organic compounds (eg BTEX) in the air quality impact assessment. These are considered to be the key pollutants associated with motor vehicles, and the human health risk assessment is consistent with the pollutants considered and modelling in the air quality impact assessment. The contributions of non-exhaust emissions (such as from tyres and brake pads) were also considered in the air quality impact assessment when assessing particulate matter. Section 6.6.2 of the human health risk assessment includes references for emission factor sources, include for VOCs emitted from vehicles.

Meeting the SEARs

Aspects related to the project design selection, including the ventilation system and measures to minimise in-tunnel and ambient exposures to vehicle emissions are primarily addressed in the main boy of the EIS document. Section 2 of the human health risk assessment has outlined the key aspects designed to minimise impacts, and hence health impacts.

In-tunnel air quality impacts to human health assessment methodology

The calculation of vehicle emissions concentrations in the project tunnels assumed constant traffic volumes and speeds within the tunnels for a one hour period and hence a one hour average would be the same as a 15-minute average, which would also be the same as a six-minute average and an in-tunnel average. Hence this data can be directly compared with a shorter averaging period criteria or data.

Human health impact study areas

Health calculations were only combined in the human health risk assessment where a change in population incidence was calculated. The calculation of the project's influence on the incidence of health indicators in the community considers the change in the numbers of cases in a population. The populations selected for the calculation were based on statistical areas as defined by the Australian Bureau of Statistics, representative of a population large enough to potentially be able to observe a change in mortality and hospitalisation statistics. Areas defined as SA3 were used in the calculations. These statistical areas were a combination of a number of suburbs. The total change in incidence is the sum over the population in all of the study area. This approach does not obscure potential health impacts in individual suburbs as the underlying / existing health of individuals throughout the study area, and the distribution of individuals 65 years and over (the more susceptible group), for the SA3 areas is adequately representative of the smaller suburbs. There are some suburbs with much smaller populations of individuals 65 years and older. For these areas the population incidence would be lower than presented for the larger statistical areas.

The calculation of change in human health risk is based on individual risk at the location of maximum impact in all of the study area as well as a range of other community receptors.

Carcinogens and impacts on human health

As per Section 6.9.5 of the EIS, the calculated risks associated with potential exposure to vehicle exhaust carcinogens have been assessed to be tolerable when in the range of greater than or equal to 10^{-6} and less than or equal to 10^{-4} of increased risk and where the increased incidence of the health impacts are considered to be acceptable.

Cumulative risks to health from air quality and noise sources

Cumulative impacts are assessed in Chapter 27 of the EIS.

The peak in-tunnel concentrations of vehicle emissions for the expected traffic cumulative scenario (2031-DSC) were assessed in Section 10.2 of the Technical working paper: Air quality (Appendix H of the EIS). The results showed that the peak concentrations for all traffic scenarios, including worst-case conditions, were well within the concentrations associated with the regulatory worst case.

The fixed facility operational noise assessment takes into account existing noise levels, with contributions from existing developments. The application of the amenity noise criteria specified in the NSW Industrial Noise Policy (and which are the more stringent criteria for most NCAs) ensures that potential 'noise creep' is appropriately taken into account. No significant new future noise sources have been identified in proximity to project operational sites.

The assessment of construction traffic noise indicates that cumulative construction traffic is unlikely to result in a noticeable increase in L_{Aeq} noise levels above impacts already predicted for the project.

5.11.2 Impacts from the Kingsgrove ventilation outlet

365 submitters raised issues arising from the Kingsgrove ventilation outlet and potential human health risks.

Issue description – Kingsgrove ventilation outlet and impacts on human health

Submissions raised concern that emissions from the Kingsgrove ventilation outlet would be unfiltered and would have an impact on human health. Specifically, concerns were raised for sensitive receptors such as toddler day care centres, the Smith Park community centre, local schools and areas around the valley.

Response

The Technical working paper: Air quality (Appendix H of the EIS) demonstrated that any predicted impact on local air quality resulting from the Kingsgrove ventilation outlet would be very small (refer to Figures K-64, K-66, K-68, K-71, K-118, K-120, K-122, K-125 in the Technical working paper: Air quality).

Assessment of the need for and benefits of end-of-pipe pollution abatement equipment is provided in the Technical working paper: Air quality (Appendix H of the EIS). This assessment determined that there was no beneficial impact on air quality by implementing tunnel air filtration, and the consequences for human health were not further assessed.

Including filtration would result in no material change in air quality in the surrounding community. Any predicted changes in the concentration of pollutants would be driven by changes in the surface road traffic.

Only a proportion of road tunnels around the world are fitted with air treatment systems. It has been shown that control of pollutants at the source, i.e. vehicle emissions controls, is significantly more effective in improving local and regional air quality (Advisory Committee on Tunnel Air Quality 2014 Technical Paper 08 (ACTAQ 2014 TP), 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.

5.11.3 Impacts from the Arncliffe ventilation outlet

334 submitters raised issues arising from the Arncliffe ventilation outlet and potential human health risks.

Issue description – Arncliffe ventilation outlet and the impacts on human health

Submissions received expressed concern regarding the health impacts of emissions released from the ventilation outlets in Arncliffe, particularly regarding the lack of filtration of the ventilation outlet. Specifically, submissions identified concerns for the diesel particles and the impact on children.

Response

The Arncliffe ventilation outlet contribution to concentrations of PM_{10} and $PM_{2.5}$ has been modelled as being very small (refer to Figures K-64, K-66, K-68, K-71, K-118, K-120, K-122, K-125 in the Technical working paper: Air quality in Appendix H of the EIS). The human health assessment explicitly assessed the health implications of diesel particulate and concluded the impacts are acceptable. The assessment conservatively assumed that 100 per cent of the $PM_{2.5}$ associated with the project is derived from diesel sources. Emissions from the Arncliffe ventilation outlet would cause no material change in air quality at any nearby sensitive receivers.

The assessment of the need for and benefits of end-of-pipe pollution abatement equipment is provided in the Technical working paper: Air quality. This assessment determined that there was no beneficial impact on air quality by implementing tunnel air filtration, and the consequences for human health were not further assessed.

Including filtration would result in no material change in air quality in the surrounding community. Any predicted changes in the concentration of pollutants would be driven by changes in the surface road traffic. Only a proportion of road tunnels around the world are fitted with air treatment systems. It has been shown that control of pollutants at the source, i.e. vehicle emissions controls, is significantly more effective in improving local and regional air quality (Advisory Committee on Tunnel Air Quality 2014 Technical Paper 08 (ACTAQ 2014 TP), 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.

The assessment in Appendix H (Technical working paper: Air Quality) of the EIS shows that the emissions from the ventilation outlet at Arncliffe would cause no material change in air quality at any receivers, and no material change in health outcomes.

5.11.4 Impacts from the St Peters ventilation outlet

356 submitters raised issues arising from the St Peters ventilation outlet and potential human health risks.

Issue description – air pollution would impact on ability to lead a healthy lifestyle

Submissions raised general concerns that emissions from the St Peters ventilation outlet would have an impact on human health. The following specific concerns were raised:

- That the facility would not be filtered
- The health of residents in Alexandria would be impacted.

Response

The St Peters ventilation outlet contribution to concentrations of PM_{10} and $PM_{2.5}$ has been modelled as being very small (refer to Figures K-64, K-66, K-68, K-71, K-118, K-120, K-122, K-125 in Appendix H of the EIS). Emissions from the St Peters ventilation outlet would cause no material change in air quality at any nearby sensitive receivers.

Assessment of the need for and benefits of end-of-pipe pollution abatement equipment is provided in the Technical working paper: Air quality (Appendix H of the EIS). This assessment determined that there was no beneficial impact on air quality by implementing tunnel air filtration, and the consequences for human health were not further assessed.

Including filtration would result in no material change in air quality in the surrounding community. Any predicted changes in the concentration of pollutants would be driven by changes in the surface road traffic. Only a proportion of road tunnels around the world are fitted with air treatment systems. It has been shown that control of pollutants at the source, i.e. vehicle emissions controls, is significantly more effective in improving local and regional air quality (Advisory Committee on Tunnel Air Quality 2014 Technical Paper 08 (ACTAQ 2014 TP), 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.

Issue description – management of air pollution once WestConnex is in operation

Submissions raised concern that potential impacts on human health as a result of emissions from the St Peters ventilation facility would be difficult to manage once the project is in operation.

Response

The tunnel ventilation system and tunnel operational parameters are designed to ensure the in-tunnel concentration limits remains below the prescribed limits and to limit the discharge of pollutants to the external environment.

Tunnel ventilation systems such as that to be installed in the project tunnels include common and well-understood technology, with a track record of simple and effective operation. Air quality inside the project tunnels and in the surrounding environment would be monitored during operation to ensure that the tunnel ventilation system is working effectively, and that operational air quality impacts (and associated human health risks) do not exceed the predictions presented in the EIS.

The air quality impact assessment included in Appendix H (Technical working paper: Air quality) of the EIS demonstrates that changes in air quality as a result of the project would be dominated by redistribution of surface traffic, rather than emissions from the project's ventilation outlets. Emissions from the ventilation outlets would have a negligible impact on human health.

5.11.5 In-tunnel air quality

32 submitters raised issues regarding in-tunnel health impacts.

Issue description – impacts on health from in tunnel air pollution

Submissions raised concern about the impact on the health of tunnel users from air pollution, in particular of regular users of the tunnel and motorcyclists. One submission specifically raised concern for health impacts of major tunnel pollutants and their cumulative effects which take more than 24 hours to clear.

The inadequate management of these risks is also highlighted within submissions for concern, with advice for asthmatics to keep windows up and to put air conditioners on recirculation.

Response

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.

These measures cannot be implemented for motorcyclists. However, during slow traffic, motorbikes are permitted to lane-split which means they can continue to travel through the tunnel in a short period of time, even when vehicles may spend longer in the tunnel. This would limit exposures within the tunnel for motorbike riders.

While concentrations of pollutants from vehicle emissions are higher within the tunnel (compared with outside the tunnel) the time spent exposed to these pollutants is short (minutes). Where health based guidelines are available, exposures within the tunnel are expected to be below these guidelines. However for nitrogen dioxide and particulates there are no health based guidelines and exposure to pollutants derived from congested traffic (including within tunnels) may increase the risk of adverse health effects.

The project has been design to achieve in-tunnel air quality criteria for key pollutants that have previously been assessed and accepted as appropriate by regulatory authorities in New South Wales. The assessment as provided in the Technical working paper: Human health (Appendix I of the EIS) has shown that available in-tunnel criteria can be met. For pollutants with no criteria, where possible, minimising exposure is recommended.

The assessment of potential health impacts on tunnel users from exposure to air pollutants is provided in Appendix I (Technical working paper: Human health) of the EIS.

5.11.6 Surface roads

2,660 submitters raised issues regarding general impacts to health along surface roads.

Issue description – impacts of increased traffic on human health

Submissions raised concerns that increased traffic on surface roads would impact on sensitive receptors (including but not limited to nearby local schools and residents). The following specific concerns were raised:

- Quality of life
- Human health impacts to residents adjacent to local roads where upgrades are proposed (hearing impairment, hypertension, ischemic heart disease, annoyance, and sleep disturbance). Changes in the immune system and birth defects are also mentioned
- Evaporated fuel is also a pollutant. About a third of vehicle hydrocarbon emissions are from evaporation, which occurs when driving, during refuelling, and even when stationary. Evaporation is increased by poorly sealed fuel tanks (including poorly fitting fuel caps or caps with worn seals), spillage, and overfilling of the fuel tank.

Response

The potential for changes in the urban environment to result in impacts on health and quality of life is complex. Changes that may occur have the potential to result in both positive and negative impacts. Positive impacts include economic benefits, changes in traffic levels in some areas, increased public open space following the closure of Alexandria Landfill and improvements in pedestrian and cycle access in some areas following completion of construction. Negative impacts may occur as a result of traffic changes during construction, property acquisitions, visual changes, air quality changes, noise impacts and changes in access / cohesion of local areas. It is acknowledged in the EIS that some of these impacts may result in increased levels of stress and anxiety in the community. However, in many cases, the impacts identified are either short-term (associated with construction only) and / or mitigation / management measures have been identified to minimise the potential impacts on the community.

For much of the community, there would either be no change or a small improvement in air quality, leading to no change or a slight reduction in human health risks. However in some areas, including along major roads and some local road upgrades in St Peters a small increase in pollutant levels may occur. The potential human health risks associated with these increases, specifically as a result of exposures to nitrogen dioxide and particulate matter, within the local community have been assessed and are considered to be acceptable.

The EIS provides an assessment of construction noise in Section 12.4 and Appendix J (Technical working paper: Noise and vibration). The assessment has been undertaken in accordance with the Secretary's Environmental Assessment Requirements (SEARs) and is consistent with the Interim Construction Noise Guideline (ICNG) (DECCW 2009a). As part of the assessment, noise modelling was undertaken to predict noise levels resulting from the construction of the project at surrounding receptor locations. Following the assessment of potential noise impacts, feasible and reasonable management measures have been established. These measures would be incorporated into a Construction Noise and Vibration Management Plan(s) which would be developed as part of the Construction Environmental Management Plan. Further detail on feasible and reasonable noise and vibration management measures is provided in Section 12.5 of the EIS.

Significant health impacts such as hearing impairment, hypertension, ischemic heart disease, annoyance, sleep disturbance, changes in the immune system and birth defects are considered to be very unlikely as a result of the project's construction and operation following the implementation of the proposed mitigation and management measures. The assessment of possible human health impacts resulting from surface road works and the operation of the surface road network presented in the Technical working paper: Human health (Appendix I of the EIS) concluded that human health impacts relating to air pollution, noise and vibration and social and economic factors would be within acceptable limits provided all feasible and reasonable management measures were employed. Impacts during construction would be temporary and would be managed via the measures to be developed and implemented as part of the Construction Environmental Management Plan and relevant sub-plans for the project.

The calculation of evaporative emissions is complex and it is difficult to link evaporative emissions to traffic activity on specific road links, as losses while driving are only one component, for example, evaporative emissions also occur when vehicles are stationary.

For these reasons evaporative emissions have been excluded from the model and the New M5 assessment. Ambient levels of the volatile organic hydrocarbons found in evaporative emissions are very low in the study area and the inclusion of evaporative emissions would be unlikely to result in adverse impacts on air quality.

Issue description – increased traffic and the impacts of pollution on human health

Submissions raised concerns regarding increased traffic and the impacts of resultant pollution at surface level on the health of residents in the region. There was particular focus on the impacts to children (specifically the increased exposure to pollution resulting in lung cancer), individuals of poor health and the local community, and the relationship between fine particle pollution, cancer and respiratory illnesses.

In particular, submissions mentioned the impact on increased pollution:

- Around the tunnel portals
- Around the St Peters interchange
- At the southern end of Sydney Park
- Along Campbell and Euston Roads
- Along local roads such as Mitchell Road, Erskineville Road, Enmore Road, King Street and Edgeware Road
- Within Alexandria and St Peters.

Response

A Technical working paper: Human health (Appendix I of the EIS) identified and assessed the potential human health impacts associated with construction and operation of the project, with Section 6.9.5 outlining a range of health effects. The health endpoints considered were:

- Long-term exposure to $PM_{2.5}$ and changes in all-cause mortality (equal or greater than 30 years of age)

- Short-term exposure and changes to the rate of hospitalisations with cardiovascular and respiratory disease (equal or greater than 65 years of age)
- Short-term exposure to PM_{10} and changes in all-cause mortality (all ages)
- Long-term exposure to $PM_{2.5}$ and changes in cardiopulmonary mortality (equal or greater than 30 years of age)
- Short-term exposure to $PM_{2.5}$ and changes in cardiovascular and respiratory mortality (all ages)
- Short-term exposure to $PM_{2.5}$ and changes in emergency department admissions for asthma in children aged 1–14 years
- Long term exposure to diesel particulate and incremental lifetime risk of lung cancer.

For much of the community, there would either be no change or a small improvement in air quality, leading to no change or a slight reduction in human health risks. However in some areas, including along major roads and some local road upgrades in St Peters, a small increase in pollutant levels may occur. The potential human health risks associated with these increases, specifically as a result of exposures to nitrogen dioxide and particulate matter, within the local community have been assessed and are considered to be acceptable (refer to Appendix I of the EIS).

5.11.7 Noise and vibration

1,286 submitters raised issues regarding noise and vibration impacts to health

Issue description – noise impacts to residents

Submissions raised concern that noise impacts to residents during construction and operation of the project would be at unsafe levels that can impact health. Specific issues raised were as follows:

- Loss of sleep and general ill-health
- Perceived lack of mitigation
- Noise impacts from St Peters interchange on the health of local residents.

Response

Section 12.4 and Appendix J (Technical working paper: Noise and vibration) of the EIS provide an assessment of construction and operation noise and vibration impact assessment. This assessment also considers the potential increase in construction and operational traffic noise and feasible and reasonable mitigation management measures where receptors are above applicable assessment criteria.

Where possible, the project has been designed and planned to avoid and minimise construction and operational noise and vibration impacts. This has included careful identification of construction compound sites and construction haulage routes to avoid residential and other noise-sensitive receptors where possible.

Chapter 12 (Noise and vibration) and Appendix J (Technical working paper: Noise and vibration) of the EIS include a detailed assessment of noise impacts generated by construction activities conducted outside standard construction hours. Table 12-30 to Table 12-40 in the EIS summarise the outcomes of this assessment, including the number of receivers anticipated to experience noise above:

- Noise management levels for activities outside standard construction hours
- The noise level at which a receiver would be characterised as highly noise affected
- Sleep disturbance thresholds.

The most significant construction activities to be conducted outside standard construction hours with respect to the level and extent of impact including local road upgrades, roadworks associated with the construction of tolling infrastructure, and piling works.

In most cases, construction sites for the project would be subject to different construction activities during different times in the construction program. This means that peak construction impacts would not be experienced for the entire expected duration of construction works. Section 6.2 of the EIS provides further details of the specific activities and expected duration of construction works at each construction ancillary facility.

Feasible and reasonable management measures which would be considered during the construction of the project could include:

- Construction site noise would be managed via consideration of the layout of construction compound sites to maximise distance and shielding to nearby receivers
- Appropriate plant and equipment would be selected for each task to minimise noise contributions
- Where feasible and reasonable, alternative work methods such as the use of hydraulic or electric-controlled units in place of diesel units would be considered and implemented
- The use of alternative machines that perform the same function (such as rubber wheeler plant) would be considered in place of steel tracked plant, and noisy equipment would be orientated away from residential receivers where feasible and reasonable
- Where practicable, consideration would be given to permanent noise barriers being scheduled for completion as early as possible to assist in mitigating construction noise
- Where feasible and reasonable the use of temporary noise walls or hoarding would be investigated where works are in proximity to residential receivers
- Noise monitoring would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress.

Where exceedances of construction noise management levels are expected both within and outside standard construction work hours, the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009) recommends strategies for noise mitigation and control. A Construction Noise and Vibration Management Plan would be developed and implemented and would identify the receiver specific mitigation and management measures to be implemented. In selecting specific management measures, the Construction Noise and Vibration Management Plan would take into account the number and sensitivity of potentially affected receivers, the nature and duration of relevant construction activities, and the availability of additional feasible and reasonable management measures.

Additional construction noise mitigation and management measures could include:

- Letterbox drop – notification of construction activities as part of periodic community updates distributed across areas surrounding construction activities
- Noise verification – receiver or catchment specific noise verification used to confirm the construction noise performance of the project and to proactively inform, where relevant, review and update noise mitigation and management measures, and site construction practices
- Individual briefing – offers of individual briefings about relevant construction activities and potential impacts with potentially affected receivers
- Receiver specific notifications – individual correspondence to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Receiver specific contact – individual phone calls, emails or visits to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Respite periods – programming of feasible and reasonable respite periods for potentially affected receivers
- Alternative accommodation – offers of reasonable alternative accommodation for receivers potentially affected by construction activities conducted at night (from 10 pm to 7 am). Alternative accommodation would be subject to consultation with the affected receiver and would take into account the duration and intensity of the potential impact.

Ongoing noise monitoring would be undertaken during construction at sensitive receivers during critical periods to identify and assist in managing high risk noise events.

In the case of operational noise, the project has been designed to include noise management measures where feasible and reasonable. This has included consideration of low noise pavements, noise barriers and the siting and layout of the operational facilities.

For the area around the St Peters interchange and the local road upgrades the night-time period was the more stringent time period for the operational traffic noise assessment. Road traffic noise levels at a total of 145 residential sensitive receivers exceeded the $L_{Aeq(9hour)}$ noise assessment criterion. In accordance with the *Noise Mitigation Guideline* (RMS, 2015) it was not reasonable to consider additional noise management measures at receivers that would experience an increase in road traffic noise levels of 2 dB(A) or less, and which were not considered 'acute.' As such a total of 144 residential receivers were identified as being eligible for consideration of additional noise management measures.

In addition, one school building at St Peters Public School and the St Peters Community Pre-school (which is classified as a child care centre under the NSW Road Noise Policy) are eligible for consideration of additional noise mitigation during the daytime only. The St Peters Community Pre-school is eligible for consideration for both external and internal areas of the property. Peripheral areas of Sydney Park and the majority of Simpson Park (active recreation areas) would be exposed to road traffic noise levels which also exceed the applicable noise assessment criteria. Road traffic noise levels at all other childcare centres, commercial properties and places of worship are predicted to comply with the criteria. Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken to meet the project noise requirements.

Further detail on the assessment of potential impacts to receivers is provided in Section 12.4.2 and Appendix J (Technical working paper: Noise and vibration) of the EIS. The operational road traffic noise assessment was completed in accordance with the RNP and Roads and Maritime's NCG and Noise Mitigation Guideline.

Issue description – assessment of construction noise impacts

Submissions raised concern that the health impacts of construction noise have not been sufficiently assessed. Specifically, concern regarded the sufficiency of assessment of high levels of noise on local roads over a three year construction period and the health impacts of the traffic movements from the Kingsgrove North Construction Site (C1).

Response

The noise and vibration impact assessment at Appendix I (Technical working paper: Noise and vibration) of the EIS has been undertaken to meet the requirements of the SEARs and has followed the guidelines specified within the SEARs.

Consistent with the Interim Construction Noise Guideline (DECC, 2009) (ICNG), noise generated by construction activities has been assessed against a series of 'noise management levels' for a series of different construction scenarios, activities and receptors.

In accordance with the ICNG, the assessment of construction noise impacts is conservatively based on the worst case 15-minute period of construction activity and does not necessarily represent the noise impact at noise sensitive receivers for an extended period of time. For example, particularly noisy activities such as rock hammering and the use of concrete saws are likely to persist for only a small proportion of the overall construction period. Further, the assumption that all construction plant and equipment would be operating simultaneously has a low likelihood of occurring in practice.

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. Opportunities to further reduce construction timeframes while protecting local amenity would be considered during detailed design and construction planning.

Feasible and reasonable management measures which would be considered during construction of the project include:

- Construction site noise would be managed via consideration of the layout of construction compound sites to maximise distance and shielding to nearby receivers
- Appropriate plant and equipment would be selected for each task to minimise noise contributions
- Where feasible and reasonable, alternative work methods such as the use of hydraulic or electric-controlled units in place of diesel units would be considered and implemented
- The use of alternative machines that perform the same function (such as rubber wheeler plant) would be considered in place of steel tracked plant, and noisy equipment would be orientated away from residential receivers where feasible and reasonable
- Where practicable, consideration would be given to permanent noise barriers being scheduled for completion as early as possible in the construction program to assist in mitigating construction noise
- Where feasible and reasonable the use of temporary noise walls or hoardings would be investigated where works or compounds are in close proximity to residential receivers
- Noise monitoring would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities (such as schools, aged cared facilities etc) at the commencement of activities and periodically during the construction program as the works progress.

Where exceedances of construction noise management levels are anticipated both within and outside standard construction work hours, the ICNG recommends strategies for noise mitigation and control. A Construction Noise and Vibration Management Plan would be developed and implemented and would identify the receiver specific mitigation and management measures to be implemented. In selecting specific management measures, the Construction Noise and Vibration Management Plan would take into account the number and sensitivity of potentially affected receivers, the nature and duration of relevant construction activities, and the availability of additional feasible and reasonable management measures.

Additional construction noise mitigation and management measures would include:

- Letterbox drop – notification of construction activities as part of periodic community updates distributed across areas surrounding construction activities
- Noise verification – receiver or catchment specific noise verification used to confirm the construction noise performance of the project and to proactively inform, where relevant, review and update noise mitigation and management measures, and site construction practices
- Individual briefing – offers of individual briefings about relevant construction activities and potential impacts with potentially affected receivers
- Receiver specific notifications – individual correspondence to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Receiver specific contact – individual phone calls, emails or visits to potentially affected receivers providing information on construction activities and potential impacts specific to the situation
- Respite periods – programming of feasible and reasonable respite periods for potentially affected receivers
- Alternative accommodation – offers of reasonable alternative accommodation for receivers potentially affected by construction activities conducted at night (from 10 pm to 7 am). Alternative accommodation would be subject to consultation with the affected receiver and would take into account the duration and intensity of the potential impact.

Ongoing noise monitoring would be undertaken during construction at sensitive receivers during critical periods to identify and assist in managing high risk noise events.

Impacts from the Kingsgrove North construction compound (C1) were identified and assessed within the relevant sections of the EIS including Biodiversity (Chapter 21), Air quality (Chapter 11), Noise and vibration (Chapter 12), Traffic (Chapter 9), Land use and property (Chapter 13), Visual impacts and urban design (Chapter 14) and Social and economic impacts (Chapter 15).

Construction vehicles movements would be generated by all compounds, however, the Kingsgrove South construction compound vehicles would access / depart via the Kingsgrove North construction compound and M5 East Motorway. Heavy vehicles involved in construction are expected to travel via existing major roadways with minimal use of local roads. Areas around Kingsgrove and St Peters area were the most affected during AM and PM peak periods and the AM off-peak period. During the quietest periods of the night-time the predicted increases in road traffic noise around all the construction compounds are more than 2 dB(A) and may exceed the adopted criteria. Spoil would be moved during the day where practical, and feasible and reasonable management strategies would be investigated, in consultation with the NSW Environment Protection Authority, to minimise the volume of heavy vehicle movements at night.

These would be detailed in the Construction Noise and Vibration Management Plan and implemented in accordance with the ICNG.

5.11.8 General health impacts

2,458 submitters raised issues regarding general impacts to health.

Issue description – general health impacts

Submissions raised concern about the health impacts as a result of the project, including:

- Health impacts associated with the St Peters interchange
- Impacts to the health of nearby residents
- Impacts to health caused by removing trees, general vegetation and open space areas
- Health impacts to the growing community due to induced demand and associated air pollution (including smog)
- Concerns that traffic pollution has been linked to higher incidence of respiratory and heart disease and lung cancer, as well as impaired lung development in children
- Concern for the health of users of nearby open space and parks
- Concern that the project does not provide health benefits
- The project is completely unacceptable given the high numbers of residents, businesses, schools, and child and aged care facilities in the area
- Impact of air quality on users of Simpson Park and the management measures to ensure continued use
- Increase in health costs as a result of the health impacts of the project
- Impacts on the local community with the combined effect of the increased in air pollution which are predicted
- Health impacts of emission on people who may be living above ground in medium-high rise apartments.

Response

A Human Health Risk Assessment (Appendix I) was undertaken to identify and assess the potential human health impacts associated with construction and operation of the project, and informs the EIS. A summary of the Human Health Risk Assessment is provided in Chapter 11 (Human health) of the EIS. The assessment of impacts on human health was supported by the outcomes of other technical working papers prepared for the EIS, including Air Quality (Appendix H), Noise and Vibration (Appendix J) and Social and Economic (Appendix M).

Appendix I (Technical Working Paper: Human Health Risk Assessment) of the EIS identifies a wide range of complex factors (acting and interacting at different scales) that can affect health and wellbeing. Potential health impacts, both positive and negative, associated with the project were evaluated within this context, noting that no single factor occurs in isolation.

Overall, the assessment concluded that where negative impacts on human health were identified for the project, these impacts were short term (during construction only) and / or appropriate mitigation or management measures were identified to minimise impacts on the community.

There is a small redistribution in air quality pollutant levels as a result of changes in the traffic volumes and distribution on the surface road network. The air quality impact assessment for the project, Appendix H (Technical working paper: Air Quality) of the EIS, demonstrates that the project would have little net impact on air quality.

The project ventilation system would be designed and operated so that it would achieve some of the most stringent standards in the world for in-tunnel air quality, and would be effective at maintaining local air quality. Emissions from the tunnel ventilation outlets, including the St Peters ventilation outlet, would therefore have no material effect on local air quality.

Modelling indicated that air quality pollutant levels would result in tolerable / acceptable risks of potential increased health effects on the community.

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 be a net increase in open space following completion of the project, with landscaping appropriate to each space.

In relation to impacts to publicly accessible areas, including open space areas and trees, the following areas are expected to be affected:

- M5 Linear Park – The majority of impacts associated to M5 Linear Park would be contained within the road reserve. Where there is encroachment into adjacent areas zoned for and used for recreational purposes, it would not substantially affect the current use of Beverly Grove Park or the broader M5 Linear Park for recreational purposes. Land required temporarily for construction would be returned to recreational purposes following the completion of construction
- Kogarah Golf Course – The project would occupy a portion of the Kogarah Golf Course during construction and operation. The construction footprint has been minimised so that nine holes would remain open during construction and reduce impacts on the recreation value of the land. The footprint of the permanent facilities has been restricted and appropriately sited to minimise impacts to the future use or development potential of the golf course site
- Sydney Park - currently used for public recreation. Around 0.2 hectares of City of Sydney land adjacent to the road corridor within Sydney Park would be permanently acquired, which represents around 0.56 per cent of the total area of Sydney Park. An additional 0.55 hectares would be temporarily occupied or leased for construction purposes from City of Sydney for the construction of a new pedestrian and cyclist bridge between Sydney Park and the St Peters interchange and returned to recreational uses following the completion of construction
- May Street Reserve - this would be partially impacted by the upgrade of Campbell Street and the intersection of Unwins Bridge Road / Campbell Street / May Street / Bedwin Road. Around 0.06 hectares of land not required for the project would be landscaped to reconfigure the May Street Reserve.
- Impacts to open space and trees in St Peters and Kingsgrove would be offset by the following:

- In eastern parts of the project, new areas of open space would be created around the St Peters interchange. A master plan solution was developed, encompassing the entire interchange site and ensuring its integration with surrounding areas. The majority of the open space to be provided by the master plan would be completed as part of the project. Around six hectares of new public open space would be delivered as part of the project. Around a further 2.5 hectares of public open space would be delivered upon completion of the proposed M4–M5 Link. The master plan solution has been envisaged as an extension of the parklands of Sydney Park further south, providing much needed open space for a growing population. Featuring landscape mounds, the design of the interchange parklands would continue the features of Sydney Park. This space would be accessed from shared paths in the east connecting to Sydney Park or via a dedicated entrance at the corner of Canal Road and Princes Highway
- In the western reaches of the project, the existing M5 Linear Park shared path would be updated to provide a three metre wide surface for the majority of its length. This would be complemented by new landscaping along the length of the Linear Park.
- Residual land along Campbell Street and Campbell Road would be landscaped to form a green corridor. The upgraded corridor includes wider footpaths and new shared paths for pedestrians and cyclists (check urban design plans for exact details)
- For the first time, residents in the fast-growing Mascot town centre would have direct pedestrian and cycle access to Sydney Park via the new Campbell Road connection
- Around 14 kilometres of new and upgraded pedestrian, shared and dedicated cycleway would be delivered as part of the project (12 kilometres in St Peters and two kilometres in Kingsgrove).

Air quality impacts to users of Simpson Park

The human health risk assessment has not undertaken detailed calculations for every location in the study area. The human health risk assessment has considered the maximum impacted location anywhere in the study area, assuming that the most impacted location may be used for residential purposes. This overestimates health impacts in all other areas, including parks and residences adjoining parks. In addition a number of representative community receptor locations were evaluated in the study area.

In relation to the assessment of noise impacts, specific locations of properties requiring noise mitigation have been identified in the human health risk assessment, as well as the noise and vibration assessment.

Increase in health costs

The project is not expected to increase health costs in the Sydney region.

Cumulative impact of air pollution on human health

The human health risk assessment has been based on data from the air quality impact assessment, which has taken into account forecast traffic growth over time (for scenarios including with the project in 2021 and in 2031, and a cumulative impact scenario involving the full WestConnex program of works in 2031). The traffic forecasts include data from the September 2014 release of population and employment projections for Greater Metropolitan Sydney as developed by the Transport for NSW Bureau of Statistics and Analytics. In addition to this, the traffic forecasts take into account an additional 1.5 million people in the area covered by the traffic model in 2031. The traffic modelling includes developments such as the Second Sydney Airport, Port Botany and Intermodal Terminals and Bays Precinct.

For the assessment of acute exposures to VOCs (Table 11-3 in the EIS), the calculated HI associated with exposure to the maximum predicted concentrations is less than one for 2021, 2031 and the cumulative scenario. On this basis there are no acute risk issues in the local community associated with the project.

For the assessment of acute exposures to VOCs (Table 11-3 in the EIS), the calculated HI associated with exposure to the maximum predicted concentrations is less than one for 2021, 2031 and the

cumulative scenario. On this basis there are no acute risk issues in the local community associated with the project.

For the assessment of chronic exposures to VOCs and PAHs (Table 11-4 in the EIS), the calculated HI associated with exposure to the maximum concentrations predicted is less than or equal to one for 2021, 2031 and the cumulative scenario. The calculated lifetime cancer risks associated with the maximum change in benzene and carcinogenic PAHs (as benzo(a)pyrene TEQ) are equal to $1x10^{-5}$ and are considered to be tolerable.

On this basis there are no chronic risk issues in the local community associated with the project. It is noted that the calculations undertaken for PAHs is based on a conservative estimate of the fraction of emissions from vehicles that comprises PAHs (as a percentage of total VOCs). The approach adopted is expected to overestimate concentrations of PAHs in air. Hence the calculations presented are considered to be a conservative upper limit estimate.

Air quality impacts on elevated receivers

An assessment was undertaken to determine the air quality impacts of the project on elevated receivers (elevated by buildings and terrain). No residential or workplace receivers (RWR receivers) were predicted to experience a change in annual mean $PM_{2.5}$ of more than 0.8µg / m^3 at a height of 10 metres (0.8 is 10 per cent of the applicable assessment criterion (8 µg / m^3)). Figure 9-99 and Figure 9-100 of Appendix H of the EIS show the changes in annual mean $PM_{2.5}$ at heights of 10 metres and 30 metres, respectively. At a height of 30 metres, 17 RWR receivers were predicted to have a change in annual mean $PM_{2.5}$ of more than 1.6µg / m^3 (1.6 is 20 per cent of the applicable assessment criterion (8 µg / m^3)). All of these receivers were very close to the assumed location of the Southern Connector ventilation facility as shown on Figure 9-101 of Appendix H. The Southern Connector is currently subject to development work by the Government and would be assessed as a separate EIS in the future.

Issue description – traffic delays

Submissions raised concern about the health impacts to users of the project as a result of traffic delays, including stress.

Response

The M5 Motorway corridor east of King Georges Road currently carries about 100,000 vehicles per day, including about 10,000 heavy vehicles. Substantial traffic delays are experienced eastbound in the morning peak period and westbound in the afternoon peak period. The result of this congestion is longer morning and afternoon peaks that extend beyond typical peak hours. Further, the road network surrounding the project corridor exhibits proportionately higher road congestion than the Sydney network average.

The project would provide significant congestion relief for the thousands of motorists who use the M5 East every day along the M5 East Motorway, including a reduction in travel times and improvements in road safety. The investment in the project, and other WestConnex stages, would facilitate a step change in network performance as well as helping to reducing the levels of stress currently experienced by motorists during the morning and afternoon peak periods.

Issue description – personal distress due to congestion

Submissions raised concern about personnel suffering distress due to the inability to use personal vehicles and public transport due to congestion.

Response

The M5 Motorway corridor east of King Georges Road currently carries about 100,000 vehicles per day, including about 10,000 heavy vehicles. Substantial traffic delays are experienced eastbound in the morning peak period and westbound in the afternoon peak period. The result of this congestion is longer morning and afternoon peaks that extend beyond typical peak hours. Further, the road network surrounding the project corridor exhibits proportionately higher road congestion than the Sydney network average.

The project would provide operational benefits in relieving congestion along the M5 East Motorway, including a reduction in travel times and improvements in road safety. After the New M5 is opened to traffic, travel times on the M5 East would be reduced by up to 45 per cent and travel speeds increased by up to 37 kilometres per hour. The investment in the project, and other WestConnex stages, would facilitate a step change in network performance as well as helping to reducing the levels of stress currently experienced by motorists during the morning and afternoon peak periods.

Issue description – health impacts to childcare centres

Submissions raised concern about health impacts to childcare centres, particularly around what safety checks / controls have been performed and what is being done to support affected childcare centres.

Response

Three areas of potential impacts on sensitive receivers, including childcare centres, have been considered. These are impacts from construction activities, from the ventilation facilities, and from changes to surface roads, including the combined effect of both ventilation outlets and surface roads.

Management measures to prevent the generation and emission of dust and air pollutants during construction are described in Section 10.10 of the EIS. A construction air quality management plan (CAQMP) would be prepared for the project as part of the CEMP which would include management measures, and procedures to guide their implementation during construction to minimise diesel emissions. These measures would include:

- All construction plant and equipment must be maintained and operated to minimise emissions. Visible smoke should not be emitted for any period greater than 15 seconds for plant not registered for use on public roads and 10 seconds for plant registered for use on public roads. The ER would be notified of any defective emission controls
- Ensure all on-road vehicles comply with relevant emissions standards
- Ensure that, where practicable, engine idling is minimised when stationary
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.

The air quality impact assessment in Appendix H (Technical working paper: Air quality) of the EIS determined that emissions from the project ventilation outlets, even in the regulatory worst case scenarios, would not result in adverse impacts on local air quality. This would be confirmed by conducting ambient air quality monitoring to demonstrate that emissions from the ventilation outlets would have no detectable impact on local air quality, including on sensitive community receivers (CWR receivers) such as child care centres and playgrounds.

All relevant monitoring results would be made publicly available.

The air quality impact assessment considered the change to ground-level concentration of multiple pollutants. A focus of the assessment was the pollutant concentrations at discrete receptors, specifically 35 identified community receptors, which included childcare centres. The broader assessment considered over 46,000 residential and workplace receptors across the modelling domain. This assessment informed the human health risk assessment in Chapter 11 and Appendix I of the EIS. Impacts on sensitive receptors such as childcare centres were therefore assessed in detail. Figures 6.3 and 6.5 present this assessment for the two key pollutants, nitrogen dioxide and particulate matter.

Management measures to prevent the generation of noise and vibration during construction are described in Section 12.5 of the EIS. A construction noise and vibration management plan(s) would be prepared and implemented consistent with the requirements of the Interim Construction Noise Guideline (DECC, 2009).

In addition to construction stage noise management measures described in the EIS, the noise and vibration sub-plan to the CEMP would include more detailed and targeted measures where reasonable and feasible. These measures would include:

- Identification of nearby residences and other sensitive land uses
- Description of approved hours of work
- Description and identification of construction activities, including work areas, equipment and duration
- Description of what work practices (generic and specific) would be applied to minimise noise and vibration
- A complaints handling process
- Noise and vibration monitoring procedures
- Overview of community consultation required for identified high impact works.

Issue description – compensation

Submissions raised a desire to receive compensation as a result of health related impacts from the project.

Response

Detailed assessments undertaken as part of the EIS have determined that adverse health effects are unlikely as a result of the project following the application of feasible and reasonable mitigation and management measures.

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 emission derived from vehicles using surface roads. For much of the community this would result in no change or a small improvement (i.e. 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 nitrogen dioxides and particulates) within the local community have been assessed and are considered to be acceptable.

Therefore compensation is not relevant as unacceptable health impacts have not been identified.

Concerned individuals have access to the WestConnex Assist support service, which is available to people directly affected by the project.

Issue description – health impacts to Sydney Park users

Submissions raised concern about health impacts to Sydney Park as a result of the St Peters interchange.

Response

The assessment in Appendix H (Technical working paper: Air quality) of the EIS shows that the emissions from the ventilation outlet at St Peters would cause no material change in air quality at any receivers, and no material change in health outcomes. Figure 9-83 in Appendix H of the EIS shows the annual mean $PM_{2.5}$ levels as a result of operation of the St Peters ventilation facility being between 0.03 µg/m^3 and 0.05 µg/m^3 in 2021 relative to the annual mean reporting standard of 8µg/m3.

The contribution of the St Peters ventilation outlet to the maximum 24-hour concentration of PM_{10} in an area of four square kilometres around the outlet has been modelled 0.10 µg/m^3 to 0.30 µg/m^3 in 2021 and 2031, respectively, relative to the 24 hour standard of 50 µg/m^3. There would no material benefit in providing filtration at the St Peters ventilation outlet.

Figures 9-49, 9-69 and 9-80 in Appendix H (Technical working paper: Air quality) of the EIS shows the change in maximum 1-hour NO_2, maximum 24 hour PM_{10} and maximum 24-hour $PM_{2.5}$, respectively, with the project in 2021 compared to the 'Do nothing' scenario. These results show that there are predicted increases in levels adjacent to Campbell Road at St Peters. The risks to human health from air quality impacts around the St Peters interchange ventilation facility are in the tolerable/acceptable range.

Issue description – general health impacts during construction

Submissions raised concern regarding health impacts of dust, noise and pollution associated with heavy machinery and transport during the three years of construction. Specifically, submissions expressed concern regarding the removal of asbestos from the Alexandria Landfill and the health risks associated with an increase in construction vehicles around the Kingsgrove North construction site. Submissions also raised concern regarding the mitigation of potential health impacts during construction and suggested that this should be considered before beginning construction.

Within submissions, the focus was generally on the impacts to residents and children in the project area.

Response

The Alexandria Landfill site stopped accepting waste in December 2014. A clean-up of the site has been underway since July 2015; however, the landfill was licensed to accept asbestos, and there is the potential for the site to contain hazardous and special wastes, including friable and non-friable asbestos. The excavation or movement of any material known or potentially containing asbestos would be undertaken in accordance with procedures detailed in an Asbestos Management Plan and Asbestos Removal Control Plan to ensure the safety of construction workers and the surrounding community during construction.

A Construction Environmental Management Plan, including a Construction Air Quality Management Plan, would be prepared prior to the start of construction works and would include measure to reduce the impacts of construction works (including the Kingsgrove North construction compound (C1) and the St Peters interchange). For almost all construction activities, significant impacts to receivers would be avoided through project design and the implementation of effective 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 to receivers would be temporary and short-term and are not considered to be significant.

As described in Chapter 12 (Noise and vibration) of the EIS, a worst case noise and vibration assessment (assuming no additional management measures are implemented) was carried out in accordance with the *Interim Construction Noise Guidelines* (DECC, 2009). For each area assessed, the noise levels at the most affected receiver have been used to represent the whole area.

A range of management measures (including temporary construction noise attenuation structures) have therefore been identified to mitigate and manage these potential impacts, including sleep disturbance from construction noise. The level of noise predicted for the project is typical for construction works using noise intensive equipment in urbanised areas. Where possible, construction works would be undertaken during the daytime. The need for additional noise management measures for works during night time would be considered during detailed design works for the project.

The SEARs do not specify a requirement for a quantitative assessment of air quality for construction. The reasons for not undertaking a quantitative assessment are provided in the air quality technical report (section 5.5.1). A quantitative assessment would not provide any additional benefits given the comprehensive management measures already recommended.

Section 6.3.1 of the human health risk assessment reviewed the risk to human health due to air quality impacts of construction. This identified the requirement for appropriate management measures

to minimise impacts on the local community. Experience has shown that implementing management measures appropriately can normally prevent significant impacts on the community.

Management measures to prevent the generation and emission of dust and air pollutants during construction are described in Chapter 30 of the EIS. A Construction Air Quality Management Plan would be prepared for the project as part of the Construction Environmental Management Plan which would include these management measures and how they would be carried out during construction to prevent dust and air pollutant emissions during construction. In addition, Safe Work Method Statements (SWMSs) would be prepared for the project as part of the project safety management system which would detail the implementation of management measures for crystalline silica, and the monitoring and reporting that would be undertaken to demonstrate the effectiveness of the measures.

5.11.9 Surface Roads

No issues raised in community submissions were categorised under 'surface roads'.

5.11.10 Anxiety

14 submitters raised issues regarding anxiety.

Issue description – impacts on mental health

Submissions raised concern about the mental health impacts caused by an increase of traffic in residential areas, the introduction of infrastructure in St Peters and stress regarding potential health impacts as a result of the project.

Response

It is acknowledged that road traffic noise may have possible effects on mental health (usually in the form of exacerbation of existing issues for vulnerable populations rather than direct effects). Annoyance can be a major consideration because it reflects the community's dislike of noise and their concerns about the full range of potential negative effects. Management measures have been considered to reduce noise levels in those locations where it would be above applicable traffic noise guideline values.

During construction, Roads and Maritime would continue to work with the community to ensure they are informed about the project and have opportunities to provide feedback to the project team. The Draft Community Consultation Framework in Appendix E of the EIS provides information on the key consultation activities and processes that would be undertaken during construction.

Access to the WestConnex Assist support service is available to those directly affected by the project.

5.11.11 Motorway impacts on health

Eight submitters raised issues arising from the Arncliffe ventilation outlet.

Issue description – increased car use impacts on health

Submissions raised concern that the project would promote car use and lead to health impacts that include feelings of isolation and depression, as well as increases in the risk of diabetes, heart disease and obesity, resulting in costs to the health sector.

Submissions also raised concerns that active transport infrastructure is required for residents to live active lifestyles and that investment in the project would limit available funding for investment in active transport methods. Also, submissions raised concerns that introducing a motorway would discourage the use of active transport options, leading to reduced health within the community.

Response

The M5 Motorway corridor east of King Georges Road currently carries about 100,000 vehicles per day, including about 10,000 heavy vehicles. Substantial traffic delays are experienced eastbound in the morning peak period and westbound in the afternoon peak period. The result of this congestion is longer morning and afternoon peaks that extend beyond typical peak hours. Further, the road network surrounding the project corridor exhibits proportionately higher road congestion than the Sydney network average.

Despite the problem of 'peak oil' and as well as efforts to limit demand for road transport, it is expected that the need for road transport would continue to grow. Congestion is expected to worsen as Sydney's population increases by another million people over the next decade. The bulk of this population growth is expected to occur in Western Sydney.

Nonetheless, once completed, it is expected the WestConnex program of works would deliver an overall reduction in the quantity of fuel consumed. It is intended to link Sydney's west with the airport and the Port Botany precinct, increasing travel speeds, decreasing travel distances and improving travel efficiency. The New M5 project would:

- reduce traffic congestion on the M5 East Motorway, improving travel times to and from the airport
- improve traffic flowing traffic conditions resulting in reduced vehicle emissions and intersection performance.

The project would provide operational benefits in relieving congestion along the M5 East Motorway, including a reduction in travel times and improvements in road safety. The investment in the project, and other WestConnex stages, would facilitate a step change in network performance as well as helping to reducing the levels of stress currently experienced by motorists during the morning and afternoon peak periods.

The New M5 would significantly improve pedestrian and cyclist connectivity by providing approximately 14 kilometres of new and upgraded pedestrian and cycle infrastructure.

By moving through traffic into underground tunnels, WestConnex would remove traffic from local roads. In 2019 when the M5 is complete but Stage 3 is not, motorists would have three routes to choose from at St Peters interchange to get to their destination. This includes Campbell Street and Campbell Road at St Peters, Euston Road at Alexandria and a new bridge over the canal to Bourke Road at Alexandria.

Provision of these upgraded connections would dissuade use of other local roads in the area which are typically more likely to be used by pedestrians and cyclists.

With the completion of Stage 3, additional through traffic would be diverted into the motorway network, further easing impacts on local road networks and assisting to minimise the interface between pedestrians / cyclists and motor vehicles.

Throughout the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. In response to submissions and as part of further design revisions since exhibition of the EIS, additional work has been undertaken to review the active transport elements of the project to ensure pedestrian and cyclist connectivity and safety are incorporated, and are consistent with existing State and local government policies and strategies.

The impact of pedestrian movements on signal phasing and intersection delays for vehicles has been assessed in the detailed operational modelling. In completing the modelling, pedestrians have been provided equivalent or better priority at signalised intersections throughout the study area.

The active transport infrastructure to be implemented as part of the project would improve connectivity for cyclists and pedestrians via provision of a more integrated network. Pedestrian and / or cyclist connectivity outcomes resulting from the project include:

- At the western end of the project, the existing M5 Linear Park shared path would be upgraded to provide a three metre wide surface for the majority of its length (around two kilometres in total)
- Providing a pedestrian and cycle friendly east / west connection to Bourke Road from Campbell Road through an addition crossing of the Alexandra Canal (currently an approximately 3.5 kilometre gap in connectivity)
- Providing a further connection along Bourke Street near Church Avenue at Mascot, integrating into the Alexandria Canal cycleway and improving north to south connection on separated paths
- Improved connections to bike friendly paths (north of Sydney Park) at Mitchell Road through shared paths along Euston Road and Sydney Park Road at St Peters

- Improved connections from Campbell Road to Simpson Park and Camdenville Park at St Peters with new separated paths
- Upgraded connections to St Peters Public School via the provision of wider footpaths and a signalised pedestrian crossing
- Improved pedestrian permeability to Sydney Park and the open space created by the New M5. All dedicated footpaths would terminate in either signalised or zebra crossings.
- Providing a connection to Canal Road from Sydney Park / Campbell Road through a shared path
- Improved connections into King Street at Newtown from the improvements to the network to the south
- A change to one-way traffic on Barwon Park Road (left turn from Campbell Road) would result in reduced traffic flow increasing the potential cycle use of the road.

Pedestrian and cyclist connectivity is discussed further in **Section 5.5.2** of this report.

Improved urban amenity and cycling infrastructure could likely attract more people to both recreational and commute cycling, with consequent positive health benefits.

Issue description – increased travel time impacts on health

Submissions raised concerns that the project would increase travel time which would impact upon wellbeing.

Response

The M5 Motorway corridor east of King Georges Road currently carries about 100,000 vehicles per day, including about 10,000 heavy vehicles. Substantial traffic delays are experienced eastbound in the morning peak period and westbound in the afternoon peak period. The result of this congestion is longer morning and afternoon peaks that extend beyond typical peak hours. Further, the road network surrounding the project corridor exhibits proportionately higher road congestion than the Sydney network average.

The project would provide operational benefits in relieving congestion along the M5 East Motorway, including a reduction in travel times and improvements in road safety. After the New M5 is opened to traffic, travel times on the M5 East would be reduced by up to 45 per cent and travel speeds increased by up to 37 kilometres per hour. he investment in the project, and other WestConnex stages, would facilitate a step change in network performance as well as helping to reducing the levels of stress currently experienced by motorists during the morning and afternoon peak periods.

Local streets and intersections around St Peters interchange would be upgraded to ensure safe and efficient connections for the New M5 and would provide the necessary additional capacity to cater for future traffic growth. The local road upgrades would include:

- A new, signalised intersection at the corner of Campbell Road and Euston Road, joining to St Peters interchange
- A new road bridge over Alexandra Canal, extending Campbell Road to connect with Bourke Road at Mascot
- Additional lanes on Euston Road between Campbell Road and Maddox Street
- Upgrading the intersection of Euston Road, Sydney Park Road and Huntley Street, including installing traffic signals
- Upgrading and widening Bourke Road/Bourke Street at Mascot between Church Street and the Campbell Road extension
- Additional lanes on the section of Gardeners Road connecting to St Peters interchange
- Additional lanes on Campbell Street and Campbell Road between the railway bridge near Camdenville Park and Bourke Road at Mascot
- New and upgraded pedestrian and cycle infrastructure.

The New M5 and the local road upgrades would cater for the expected population growth in Mascot and areas around St Peters, improve access to St Peters, Marrickville, Alexandria, Green Square and Mascot and provide new links between these suburbs. Substantial new capacity would be created along Campbell Street and Euston Road, directing through traffic along these routes and away from residential properties.

In addition, traffic volumes would also decrease along Princes Highway including past residential properties, and two new road crossings over Alexandra Canal would address existing bottlenecks on the Ricketty Street Bridge.

These reductions in travel times and increased average speeds along the M5 East Motorway corridor and on local roads around St Peters would be expected to improve wellbeing by providing strong local and regional connections.

5.11.12 Government policy

Two submitters raised issues regarding government health policies.

Issue description – NSW Government emissions standards

Submissions raised concern that by opposing to tightening of emissions standards the NSW Government does not consider public health a priority.

Response

Air quality and emissions standards in NSW are set by the Environment Protection Authority, having regard to national and international practice, and taking into account local conditions and regulatory requirements.

Changes in air quality and emissions standards is beyond the scope of the project.

5.11.13 Impacts from ventilation outlets (non-specific)

1,775 submitters raised issues regarding government health policies.

Issue description – unfiltered ventilation outlets

Submissions raised concern that unfiltered ventilation outlets would adversely affect population health, some submissions acknowledging that air pollution increases risks of cancer and respiratory illnesses.

Response

Assessment of the need for and benefits of end-of-pipe pollution abatement equipment is in the Technical working paper: Air quality (Appendix H of the EIS, Section 11.2.2). This assessment determined that there was no beneficial impact on air quality by implementing tunnel air filtration, and the consequences for human health were not further assessed.

The Technical working paper: Air quality (Appendix H of the EIS) demonstrated that any predicted impact on local air quality would be very small. Refer to Figures K-64, K-66, K-68, K-71, K-118, K-120, K-122, K-125 in Appendix H.

Including filtration would result in no material change in air quality in the surrounding community. Any predicted changes in the concentration of pollutants would be driven by changes in the surface road traffic.

Very few tunnels around the world are equipped with air treatment systems. There are around 60 installations of electro-static precipitators (ESP) to remove particulate matter (PM). 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.

It has been shown that control of pollutants at the source, i.e. vehicle emissions controls, is significantly more effective in improving local and regional air quality (Advisory Committee on Tunnel

Air Quality 2014 Technical Paper 08 (ACTAQ 2014 TP), 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.

Issue description – location of the ventilation outlets (non-specific) to sensitive receptors

Submissions expressed concern of the impact of ventilation outlets located in proximity to schools and open space areas both generally and specifically in the case of incidents occurring within the tunnels.

Response

The air quality impact assessment, Appendix H (Technical working paper: Air quality) of the EIS, demonstrated that emissions from the project ventilation outlets, would have no material effect on local air quality. This would be confirmed by conducting ambient air quality monitoring to demonstrate that emissions from the ventilation outlets would have no detectable impact on local air quality, including on sensitive community receptors such as child care centres and playgrounds.

Incident management procedures (refer to Section 5.8.1 of the EIS) would be developed to manage unplanned events in the tunnels. Such events would have little or no additional impacts on emissions from the ventilation outlets, except that smoke may be emitted in the case of a fire emergency in the tunnel. The frequency of tunnel fires is very low in Australian tunnels and smoke and heat is largely controlled by the deluge system within the tunnel.

5.12 Land use and property

5.12.1 Property acquisition

3,859 submitters raised issues regarding property acquisition.

Issue description – need and justification for private property acquisition

Submissions expressed concern regarding the need to acquire private properties. Submissions were also opposed to, or sought additional information regarding, the justification for acquiring properties.

Response

Minimising the acquisition of private property was a key aim of the project design. This has been achieved by locating the majority of the project's surface infrastructure within existing road reserves where practicable, and by using properties already owned by Roads and Maritime and the NSW Government (for example the use of the former Alexandria Landfill as the proposed St Peters interchange). Given the highly developed urban landscape and limited availability of space, some acquisition of property to construct and operate the New M5 is unavoidable.

Although the majority of the project comprises twin motorway tunnels, some impact would be required where the tunnels emerge at the surface, to connect the project to the surrounding road network and to provide essential project infrastructure such as ventilation facilities. A surface motorway would have significantly higher property impacts.

Table 5-11 of the EIS provides an indicative summary of the parcels of land that would be permanently acquired by the project. Around 70 per cent of the properties that need to be acquired for the project (256 land parcels from the project total of 364) are owned by either Roads and Maritime, local councils or other NSW Government agencies. Further information about the project design and how it has been refined to minimise the number of private properties needing to be acquired is provided in Chapter 4 of the EIS (Project development and alternatives). Further information on the acquisition process is provided in Section 13.3 of the EIS.

Properties to be acquired for the project are identified in Section 13.3 and Appendix D (Properties affected by acquisition) of the EIS. Opportunities to further minimise the extent of acquisition would be considered during the detailed design process, where feasible and reasonable.

Issue description – acquisition of public land including open space and green spaces

Submissions 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. Areas specifically identified included Sydney Park, Beverly Grove Park, Kingsgrove Avenue Reserve, M5 Linear Park, May Street Reserve and Camdenville Park.

Response

The project has been designed to minimise the need for land acquisition, where feasible and reasonable. Given the limited availability of space in the project area and the desire to minimise acquisition of private property, some public land, including public recreation areas, would be required to facilitate construction of the project, resulting in the temporary occupation or permanent acquisition of public land.

All land that is temporarily occupied during construction of the project, and which is not required for permanent operational infrastructure, would be rehabilitated and returned to its original use or another use agreed with the owner following completion of construction activities. In these areas, the project would not have any ongoing impact on the use of land for public recreation purposes.

The project would facilitate the creation of about six hectares of new open space at the St Peters interchange. About 2.5 hectares of additional open space would be created at the St Peters interchange upon completion of the future WestConnex M4–M5 Link. In total over six hectares of new open space would be provided upon completion of the New M5.

Additionally, impacts to public recreation areas would not be significant because:

- The majority of the western surface works associated with upgrades to the existing M5 East Motorway would be contained within the road reserve. Where there is encroachment into adjacent areas zoned for and used for recreational purposes, it would not substantially affect the current recreational use of Beverly Grove Park or the broader M5 Linear Park
- Although the Kingsgrove Avenue Reserve is used for occasional recreational purposes, the land identified for the location of the Bexley Road South motorway operations complex (MOC2) is zoned SP2 Infrastructure, and is intended for longer term development for infrastructure (particularly road infrastructure). Recreational uses have been accommodated on this site as an interim use. While this interim potential for recreational uses would be lost, the permanent use of the site for road infrastructure is consistent with the established land use zoning
- Areas of Camdenville Park (around 1.1 hectares) and May Street Reserve (around 0.015 hectares) would be permanently occupied by upgraded road infrastructure along Campbell Street and the intersection of Unwins Bridge Road / Campbell Street / May Street / Bedwin Road including for upgrades to the existing drainage basin within Camdenville Park. Most of the land required for construction in Camdenville Park is not currently public open space and is secured by fencing preventing public access. Areas not required for permanent project infrastructure would be re-instated and enhanced in consultation with Marrickville Council, consistent with the vision presented in the *Camdenville Park Draft Plan of Management* (Marrickville Council, March 2014)
- Strips of land along the southern and eastern boundaries of Sydney Park, totalling around 0.2 hectares or about 0.6 per cent of the total area of the park, would be predominantly used for the provision of pedestrian and cyclist infrastructure, to enhance connectivity in and around Sydney Park. This infrastructure would enhance, rather than detract from, the public recreational values of the park. This land, as outlined by the City of Sydney, is dedicated road space and has been subject to a long-standing road widening reservation.

Permanent impacts of the project on public recreation areas would be further 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.

Parts of the former Alexandria Landfill site not required for the St Peters interchange would also be re-instated and landscaped with the aim of providing these areas as additional public recreational space

(refer to Figure 5-26 of the EIS). This would provide a positive contribution to the total supply of open space in the local area and given its proximity to Sydney Park and new pedestrian and cyclist infrastructure, would represent a significant enhancement to existing park areas. As part of St Peters interchange, there would be about 2.5 hectares of additional green open space which would connect to Sydney Park by a pedestrian and cyclist overpass bridge on Campbell Road.

Social and economic issues associated with public spaces and green spaces are discussed in Section 5.14.10 and Section 5.14.11 of this report.

Issue description – adequacy and equitability of the property acquisition process

Submissions expressed concern that the property acquisition process is inequitable, that compensation is inadequate and that the process has been poorly managed.

Response

Roads and Maritime is conducting property acquisition for the project in accordance with the principles in the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW) and the *Roads and Maritime Land Acquisition Information Guide* (Roads and Maritime, 2014). The *Land Acquisition (Just Terms Compensation) Act 1991* (NSW) states that an owner is entitled to compensation for their land being acquired including the market value of the property. It is based on the assessment of the market value, unaffected by the road project.

Where property acquisition is initiated by Roads and Maritime, the owner of each affected property and those with an interest in the land are contacted by letter advising that:

- Their property is required for the project and that Roads and Maritime wishes to start the acquisition process
- An independent valuer instructed by Roads and Maritime would contact them to make an appointment to inspect their property for the purpose of carrying out a property valuation
- A valuation would be carried out before Roads and Maritime makes a formal offer to the landowner.

The owner may also choose to engage its own registered valuer to carry out a valuation of the property. The valuations on behalf of both Roads and Maritime and the property owner are discussed between the parties, including the respective valuers.

The total purchase price may where relevant, also include, in addition to the market value, reasonable costs arising from any need to relocate, such as:

- Legal costs including conveyancing fees
- Valuation fees
- Removalist costs
- Pest and building inspection costs
- Stamp duty costs in connection with the purchase of another property of equal value
- Mortgage re-establishment costs and other payments
- Solatium (an amount of money to compensate an owner for the inconvenience of having to move their primary residence).

Under the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW), where property compensation offers are in dispute, Roads and Maritime attempts to resolve the dispute by negotiation. The Valuer General provides independent valuations for all properties that are unable to be agreed between Roads and Maritime and the owner and as a resultant must be compulsorily acquired, in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW).

Further detail regarding the property acquisition process including remuneration / compensation and the property valuation process is provided in Section 13.3 of the EIS.

Consultation with affected residential, industrial and commercial property owners and business operators to discuss property impacts, including, where necessary property acquisition, has been ongoing. Consultation with affected property owners would continue during detailed design and through to construction. Future consultation arrangements are discussed in **Chapter 2** (Community involvement) of this report.

5.12.2 Substratum acquisition

No issues raised in community submissions were categorised under 'substratum acquisition'

5.12.3 Impacts to utilities and roads

No issues raised in community submissions were categorised under 'impacts to utilities and roads'.

5.12.4 Future development impacts and opportunities

15 submitters raised issues regarding impacts on future developments and opportunities for future developments (including prospective uses of residual land).

Issue description – future development of St Peters interchange space

Submissions raised concerns about whether the use of space at the St Peters interchange represents the highest and best value future use of this space, where this site could potentially be used to meet housing, employment or open space needs.

Response

The St Peters interchange would be developed on land formerly used for the Alexandria Landfill. Parts of the site that are not required for the interchange would be rehabilitated and landscaped to provide additional open space and public recreation areas (refer to issue 5.12.1 (2) in this report). Development of the site for the St Peters interchange and public open space, including pedestrian and cyclist infrastructure, represents a beneficial re-development of land historically used as a landfill.

The St Peters interchange site is contaminated as a result of its historical uses, including as:

- A brickworks quarry between 1908 and 1962
- A solid waste landfill owned and operated by the City of Sydney Council from 1988 to 2002
- A solid waste landfill and resource recovery facility run by Dial a Dump Industries from 2002 until its acquisition by the NSW Government in December 2014.

The proposed use as open space is considered to be the highest and best future use of the site, especially given it would provide for additional green space in an otherwise highly urbanised and industrialised area.

Based on identified contamination levels on the site, and the need for ongoing leachate and landfill gas management, establishment of more sensitive land uses such as residential development would be difficult to achieve, due to the required state of remediation. The cost of remediating the site to a standard suitable for residential or other sensitive land uses would also likely be prohibitive. Further, the location of the site (surrounded by existing industrial development) would make significant intensification of residential development in the area undesirable from a strategic land use planning perspective. Furthermore, the location of a major flight path above the St Peters interchange site would present further barriers to residential development in terms of creating the requisite amenity and / or increases in construction costs to achieve the requisite amenity.

As detailed in Section 4.4.2 of the EIS, a significant factor in the selection of the Alexandria Landfill site as the preferred location for the St Peters interchange was the avoidance of impacts on established industrial development and open space areas. In this context, redevelopment of the Alexandria Landfill site for the St Peters interchange and additional open space areas is more desirable than use of the site for industrial development.

Issue description – urban sprawl resulting from new roads

Submissions raised concern regarding urban sprawl as a result of new roads.

Response

Urban sprawl refers to the process of large-scale development resulting in low-density, scattered, discontinuous car-dependent construction, usually on the periphery of declining older suburbs and shrinking city centres (Hayden, 2004).

The objective of the project is not to facilitate urban sprawl but instead to support NSW's major sources of economic activity and provide one part of an integrated transport solution to address the currently inadequate, and highly congested, road network. WestConnex also has the potential to be a catalyst for major urban renewal, as identified in *A Plan for Growing Sydney* (NSW Government, 2014).

Figure 13-1 of the EIS shows the regional 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 the form of the projects tunnels, with some changes to surface infrastructure including upgrade works to the existing road network (i.e. widening). The project supports major growth centres already designated by Government and under development within Sydney's south west. As outlined in the WestConnex Updated Strategic Business Case, population growth in the west is expected to outstrip the east; while job growth in the east is expected to outpace the west.

The project would better connect this population growth in the western half of the city to the increased employment growth in the eastern half of the city, linking people with jobs and places of employment.

Issue description – impact of tunnel on future residential developments

Submissions raised concern that the construction and operation of the project tunnels would impact potential residential developments; specifically basement developments and medium density developments (i.e. two to three storey multi dwelling housing).

Response

As described in Section 13.3.2 of the EIS, in most cases, subsurface acquisition would not affect the future use of property at the surface, under current local planning controls. Subject to necessary development assessment and approval requirements, property owners 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.

The *Land Acquisition (Just Terms Compensation) Act 1991* (NSW) provides that compensation is not payable for the majority of subsurface acquisition of land or easements, unless specific circumstances as detailed in that Act apply. Appendix C of the *Roads and Maritime Land Acquisition Information Guide* (Roads and Maritime, 2014) sets out in detail the compensation provisions of the Act relating to subsurface acquisition.

Issue description – land zoning clarification

Submissions requested clarification regarding the zoning of the unit blocks on the corner of Euston Road and Sydney Park, stating that they have been incorrectly described as 'light industrial'.

Response

Land to the north west of the intersection of Euston Road and Sydney Park Road which is currently occupied by residential development is zoned a mix of R1 General Residential, B4 Mixed Use and SP2 Infrastructure (Classified Road) under the *Sydney Local Environmental Plan 2012*. This land use zoning is shown in Figure 13-5 of the EIS.

Issue description – Sydney Park high rise developments

Submissions raised concerns that the project would result in a loss of 11,000 square metres (1.1 hectares) of Sydney Park and that this would have an impact on potential future high rise developments around the park.

Response

As stated in Section 15.3.1 of the EIS, land impacts on Sydney Park would include:

- Around 0.2 hectares of City of Sydney land adjacent to the road corridor to be permanently acquired for the project
- An additional 0.55 hectares would be leased or temporarily occupied for construction purposes from City of Sydney and returned to recreational uses following the completion of construction
- Around 146 square metres of Sydney Water land adjacent to the road reserve within Sydney Park would be acquired for the project.

The permanent loss of 0.2 hectares adjacent to the road corridor for the project would not have an impact on potential future high rise developments around Sydney Park. Development potential of land around Sydney Park would be limited by existing land zoning planning controls and would be subject to assessment and approval processes under the *Environmental Planning and Assessment Act 1979*.

Issue description – Gardeners Road future development

The widening of Gardeners Road and limitations on access to the subject sites for heavy vehicles in particular would significantly restrict future development occurring on the sites.

Response

Changes to site access along Gardeners Road and other local road upgrades are summarised in Table 13-9 of the EIS. Local road upgrades have been designed to maintain existing access arrangements where feasible and reasonable, or otherwise provide equivalent modified or alternative access arrangements. During detailed design, Roads and Maritime would consult with affected land owners and operators in relation to the design and implementation of modified and alternative access arrangements, to ensure that such arrangements accommodate the needs of existing and proposed future development where feasible and reasonable to do so.

Issue description – mixed use developments

Submissions expressed concern that industrial land around the St Peters interchange and local road upgrades would be subject to sterilisation as a result of the project, limiting the potential for quality liveable mixed use environments.

Response

Land use changes as a result of the project and the acquisition of land are detailed in Section 13.3 of the EIS. Through consultation with local councils it has been found that there is no desire to change the current zoning of industrial or business enterprise lands in and around the St Peters interchange.

The project would result in the removal of the Alexandria Landfill site from the stock of potential industrial development sites in the St Peters area. This loss of industrial land would not be significant because:

- Other land zoned for industrial and mixed use development is in reasonable supply in the area
- The land affected by the project has been historically used as a landfill site, rather than for higher value industrial development and remediation of the site for these uses is likely to be unfeasible (as noted in **Section 5.12.4 (1)** of this report)
- The project would provide additional road network capacity connecting to other industrial lands along the M5 East Motorway corridor, and through the reduction of congestion would enhance the desirability and development potential of these other existing industrial lands.

Issue description – impact of project on future land uses

Submissions raised concern that the EIS does not specify which lands would be enhanced in reference to the 'Enhance the productivity of commercial and freight generating land uses strategically located near transport infrastructure' project objective and that it is not possible to evaluate the future impact of the project on land uses.

Response

Through the provision of additional road network capacity, a reduction in traffic congestion and improved travel times along the M5 East Motorway corridor, the New M5 would provide an opportunity for enhanced productivity for commercial and freight users currently using this corridor. These users are numerous and include all operations that use the M5 East Motorway corridor for the transport of freight, employees and resources. The most significant potential enhancement of productivity is likely to be experienced by those commercial and freight-related developments that rely heavily on the M5 East Motorway corridor and other motorway links such as the Westlink M7 for transport, including those developments that have strategically located close to the corridor to benefit from proximity to a major transport connection between south western Sydney, the Sydney CBD and the Sydney Airport / Port Botany precinct.

Issue description – Kingsgrove South Industrial Precinct development potential

Submissions raised concerns that the project would have an impact on the future development potential of the Kingsgrove South Industrial Precinct (14-26 Commercial Road), stating that the project has potential to sterilise the land, and negatively impact on the objectives of '*A Plan for Growing Sydney*'.

Response

The project would not directly impact on the land at 14-26 Commercial Road at Kingsgrove South during construction or operation. The urban design plan prepared for the project would address these potential impacts of the permanent infrastructure and to ensure that these are sympathetic to the local environment. As this location is currently within an industrial area, it is unlikely future residential growth would take place in the area.

WestConnex is a key enabler to achieving the goals set out in *A Plan for Growing Sydney* (NSW Government, 2014), allowing for further growth and development as a result of reduced surface traffic in some parts of Sydney and better connectivity across the city.

Issue description – potential for additional property acquisitions

Submissions raised concerns that projected traffic increases would result in congestion on the broader road network around the St Peters interchange, which would require future additional road upgrades and that additional property acquisitions would be required for these upgrades. Specific concerns were raised with regard to properties adjacent to following areas:

- Euston Road between Sydney Park Road and Maddox Street
- Local Roads in proximity to the St Peters interchange including Campbell Street, Unwins Bridge Road and Edgeware Road.

Response

The upgrades to local roads around the St Peters interchange as part of the project would deliver safe and efficient connections to the New M5, providing the necessary additional capacity in the road network to cater for the forecast traffic demand in these areas.

The local road upgrades would include:

- A new, signalised intersection at the corner of Campbell Road and Euston Road, joining to St Peters interchange
- A new road bridge over Alexandra Canal, extending Campbell Road to connect with Bourke Road at Mascot
- Additional lanes on Euston Road between Campbell Road and Maddox Street
- Upgrading the intersection of Euston Road, Sydney Park Road and Huntley Street, including installing traffic signals
- Upgrading and widening Bourke Road / Bourke Street at Mascot between Church Street and the Campbell Road extension

- Additional lanes on the section of Gardeners Road connecting to St Peters interchange
- Additional lanes on Campbell Street and Campbell Road between the railway bridge near Camdenville Park and Bourke Road at Mascot
- New and upgraded pedestrian and cycle infrastructure.

These upgrades would be undertaken as part of the project and would have an immediate impact in managing forecast traffic demand around St Peters, at both the modelled year of opening (2021) and the modelled future year (2031). The upgrades would not require additional property acquisitions beyond those considered in the EIS.

5.12.5 Property values

37 submitters raised issues regarding property values.

Issue description – impact of property values

Submissions raised concerns about the potential for the project to negatively affect valuations of non-acquired properties adjacent to the project.

Response

The improved traffic connectivity that would result from this major infrastructure investment would likely be a positive influence on the property values of surrounding communities.

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 and 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.

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.

Issue description – home owners obligation to disclose

Submissions queried whether home owners were obligated to inform potential property buyers of potential impacts to the property as a result of the project.

Response

Disclosure obligations for parties engaged in commercial transactions involving property in NSW are beyond the scope of the New M5 project, the EIS and this Submissions and Preferred Infrastructure Report.

5.12.6 General damage to property

324 submitters raised issues regarding general damage to property.

Issue description – damage to structural integrity of residential and heritage buildings

Submissions raised concerns over the potential risks to the structural integrity of residential and heritage buildings due to tunnel construction. Submissions expressed further concern regarding cracked walls, dust / grime impacts and general property damage as a result of the project works.

Response

Residential buildings

The potential impacts from vibration and settlement on residential buildings have been assessed in Appendix J (Technical working paper: Noise and vibration), Chapter 12 (Noise and vibration) and Chapter 19 (Groundwater) of the EIS.

The EIS demonstrates that applicable structural damage criteria would not be exceeded by the tunnelling activities, as outlined in Table 12-7 of the EIS. Further, blasting would be designed to

comply with applicable vibration criteria. On this basis, the risk of tunnelling activities generating vibration sufficient to damage surface structures, including residential buildings, would be low.

Most of the buildings in the settlement assessment were identified as having a predicted settlement of less than 20 millimetres and subsequently assessed as having a building damage category of 'negligible'. The exceptions are those buildings located nearest the tunnel portals and cavern locations. The Southern Connector caverns and the M4–M5 Link caverns have a predicted settlement higher than 20 millimetres but are less than the limit of 30 millimetres for non-sensitive buildings. Two buildings on Canal Road at St Peters have an assessed damage category of 'very slight', which may result in cosmetic damage only.

It is expected that settlement would stabilise within about two months of tunnel excavation occurring under a structure. Building condition surveys would be completed both before and after tunnelling and other vibration intensive works to identify existing damage and any damage due to the project works. The surveys would be undertaken on properties and structures located:

- Within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels)
- Where the potential for exceedances of the blasting criteria is identified.

Where project induced settlement or vibration impacts are deemed the cause of cracking, cracks would be filled, new external masonry cracks would be repointed for weather tightness, and depressions created by depressions would be rectified. A monitoring program would also be undertaken to ensure that settlement has stabilised before monitoring is completed.

Heritage buildings

A detailed assessment of the potential impacts of tunnelling works on the structural integrity of heritage items is provided in Section 20.3.1 of the EIS. The assessment identified that 34 non-Aboriginal heritage items may be affected by vibration, settlement and groundwater drawdown as a result of tunnelling works. These heritage items are primarily located immediately above or close to tunnelling works, and consist mainly of heritage-listed residential houses. Four of these items would also be directly impacted by construction vibration due to surface works. Impacts on these items are anticipated to be minor to negligible, and the overall heritage value of the heritage items would not be significantly impacted by the project.

Section 5.5 of the Technical working paper: Noise and vibration (Appendix J of the EIS) provides an assessment of potential construction vibration impacts as a result of works at surface and below ground (tunnelling). It concludes that, for tunnelling activities, the predicted vibration levels at heritage items would be around two millimetres per second or less, which is below the recommended maximum level of vibration that would be applicable to heritage structures set within the German Standard DIN 4150 - Part 3 - Structural Vibration in Buildings – Effects on Structures.

The potential impacts on heritage structures as a result of ground settlement would be dependent on the geotechnical conditions, the depth of the tunnelling activity, the number of storeys of the building, and the position, condition and masonry of the structure itself. The calculated settlement for the project is generally less than 20 millimetres for the majority of the tunnel alignment. Locations of peak settlement are at the portals and at the Y-junction caverns. All heritage structures have a predicted settlement of less than 20 millimetres and have been assessed as having a building damage category of 'negligible'. It is expected that settlement would stabilise within two months of the roadheader passing under a structure. Section 19.3.2 of the EIS provides an assessment of the potential impacts of ground settlement on structures.

Further assessments would be undertaken during detailed design to confirm the level of potential impact on structures and to confirm appropriate management measures to minimise these impacts. For some properties, this may involve undertaking an existing condition survey and a program of monitoring.

5.12.7 Assessment of damage to property

Two submitters raised issues regarding how damage to property would be assessed.

Issue description – assessment process for damage to property

Submissions queried the process for assessing damage to property where it is considered to have occurred during project construction.

Response

As outlined in **Chapter 8** (Revised environmental management measures) of this report, before the start of tunnelling or other vibration intensive works at each site, existing condition surveys would be undertaken on properties and structures:

- Within the project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels)
- Within 50 metres of surface works
- Where there is the potential for the blasting criteria to be exceeded.

Building condition surveys of potentially affected structures would be completed both before and after construction works, to identify pre-existing damage and any damage that may be sustained due to the works.

Where damage is shown to have occurred due to the project, consultation would be undertaken with the affected landowner to determine rehabilitation requirements in order to restore the property to its pre-construction condition. All rehabilitation works would be undertaken at no cost to the landowner.

Additional information regarding property damage impacts and existing condition surveys is provided in **Section 5.9.10** of this report.

5.12.8 Access to properties - construction

51 submitters raised issues regarding 'access to properties - construction'.

Issue description – access to properties along Belmont Street

Submissions raised concerns about property access along Belmont Street during construction of the project.

Response

The project would not directly impact on Belmont Street at Alexandria, or the properties along the street, during construction or operation. No changes to access for properties along Belmont Street would be required during construction. Further, Belmont Street is not proposed as a construction haulage route.

Issue description – access to Campbell Road terraces along Campbell Road

Submissions raised concerns about property access to terraces along Campbell Road during construction of the project.

Response

Access to properties along Campbell Road would remain during construction and operation of the project. During the construction of the project, works along Campbell Road / Campbell Street would be carried out in stages. Generally, at least one lane in each direction would be maintained to facilitate access. However, temporary diversions would be required during some stages of construction, for example to facilitate the safe lifting and installation of infrastructure for the pedestrian and cycle bridge.

Construction of the project would be subject to careful traffic management to maintain the functionality of surrounding roads, and to preserve the safety of the public (i.e. pedestrians and cyclists), motorists and construction personnel.

Property access measures during construction include:

- Prior to any impact to access, alternative arrangements would be negotiated with the affected parties in order to enable continued access and to minimise disruption as much as reasonably possible
- Affected property owners and community facilities would be provided with advanced notification of relevant project schedules, construction works and changes to access arrangements
- Community updates would be provided on changes to the local road network within the project area during construction
- Appropriate signage would be provided advising of walking track closures and alternative walking routes.

5.12.9 Access to properties – operation

12 submitters raised issues regarding access to property during operation.

Issue description – access to properties along Campbell Street and access to adjacent streets

Submissions requested additional detail regarding property access along Campbell Street and access to adjacent streets (including Edgeware Road) at the completion of the project.

Response

Access to properties along Campbell Street and Edgeware Road would remain during construction and operation of the project. The number of properties along Campbell Street which may require extension of the property concrete driveway to suit the new kerb position of the widened road would be confirmed during detailed design.

Ongoing consultation with affected property owners would take place during detailed design and through to construction. Future consultation arrangements are discussed in **Chapter 2** of this report.

Issue description – Gardeners Road widening impacts to heavy vehicle access

The widening of Gardeners Road would significantly restrict access for heavy vehicles. As a direct result of the proposed road upgrading, Lonsdale, Farmer Joe's Chickens and Cue Clothing Company businesses would not be able to continue from their current sites.

Response

Changes to site access along Gardeners Road and other local road upgrades are summarised in Table 13-9 of the EIS. Local road upgrades have been designed to maintain existing access arrangements where feasible and reasonable, or otherwise provide equivalent modified or alternative access arrangements. During detailed design, Roads and Maritime would consult with affected land owners and operators in relation to the design and implementation of modified and alternative access arrangements, to ensure that such arrangements accommodate the needs of existing development where feasible and reasonable to do so.

5.13 Urban design and visual amenity

5.13.1 Construction light spill

Five submitters raised issues regarding light spill during construction.

Issue description – temporary lighting of diverted shared path

One submission requested the temporary lighting of the diverted shared path at Beverly Grove Park be appropriately managed to prevent impacts onto adjacent residences, and suggested that mature trees be planted close to the residential fence line forming a barrier from the diverted shared path to block construction lighting.

Response

Temporary lighting for shared paths located within the M5 Linear Park (including Beverly Grove Park) would be designed to minimise light spill to adjoining residential properties while maintaining a safe night time environment for path users (as described in environmental management measure V10).

At the commencement of construction, the shared path to the north of the M5 East Motorway would be temporarily realigned to follow the northern boundary of Beverly Grove Park. At the completion of construction, the shared path would be relocated within Beverly Grove Park, away from residences.

During construction, revegetation and landscaping focussed on minimising lighting and other visual impacts from construction compounds (as opposed to impacts from the temporarily diverted shared path). These works would be required to be undertaken progressively (environmental management measure VO3) with the use of fast-growing species (rather than mature trees) where reasonable and feasible (environmental management measure VO2).

Chapter 14 (Visual impacts and urban design) of the EIS (and as amended by **Chapter 8** (Revised summary of environmental management measures) of this report) describes what mitigation and management measures would be implemented with respect to temporary lighting of the diverted shared path.

Issue description – light from construction compounds

Submissions requested that residents in proximity to construction compounds (particularly C1 at Beverly Grove Park) be compensated for disturbances to sleep during night construction as light from construction compounds is predicted to persist for three / four years. It was also suggested that affected properties be fitted with light blocking devices.

Submissions also raised concern over impacts from the Campbell Road construction compound (C9) and Sydney Park construction compound (C14) in relation to lighting, and visual impacts.

Response

The potential night lighting impacts on adjoining residential areas during the construction of the project are outlined in Table 14-12 of Chapter 14 (Visual impacts and urban design) in the EIS. This assessment assumed that light levels would be sufficient to meet work health and safety requirements and site security levels. This assessment identified the potential for four groups of residential receiver locations to have a high to moderate range of impact, with only two groups of residential receiver locations in the high range of potential impact. This included residential receiver locations adjacent to the Kingsgrove North construction compound (C1), Campbell Road construction compound (C9) and Sydney Park construction compound (C14).

Temporary noise barriers would assist in minimising the amount of light spill into adjoining residential properties. However, to further reduce the potential for light spill, cut-off or directed lighting would be used within and outside of construction compounds with lighting location and direction considered to ensure glare and light spill are minimised (environmental management measure V09).

Existing vegetation around the perimeter of the construction compounds would also be retained where feasible and reasonable (environmental management measure V01). Temporary noise barriers would also be erected early within the site establishment phase to minimise noise impacts and provide visual screening (environmental management measure V04).

Minimising impacts on neighbouring residential areas would focus on design and management approaches within the construction compounds, rather than at receiver treatments and compensation. Roads and Maritime would continue to consult with the local community during prior to and during construction to seek ongoing feedback on the management of construction activities, as detailed in the Draft Community Consultation Framework (Appendix E) if the EIS.

Further information can be found in Chapter 14 (Visual impacts and urban design) of the EIS (and as amended by **Chapter 8** (Revised summary of environmental management measures) of this report).

5.13.2 Construction visual impact

Four submitters raised issues regarding visual impacts of construction.

Issue description – mature tree plantings

Submissions requested mitigation of construction impacts through planting of mature trees along diverted shared paths and residential property lines, and expressed concern regarding visual impacts due to the loss of mature vegetation along the M5 East Motorway and adjacent walkways.

Response

The construction footprint has been developed to avoid and / or minimise impacts to mature vegetation and open space where possible. However, the project would result in the removal of vegetation, and the temporary or permanent loss of open space. Opportunities to further reduce the footprint and reduce the extent of impacts to established vegetation would be considered during detailed design.

Notwithstanding these measures, the project would have short term impacts on the visual character of these spaces. To manage temporary visual impacts, the following environmental management measures would be implemented:

- Existing vegetation around the perimeter of the construction compounds would be retained where feasible and reasonable (V01)
- Revegetation and landscaping would be undertaken progressively (V03)
- Landscape planting would also use fast growing species where reasonable and feasible (V02). This would soften views of construction sites, particularly for compounds located within public recreational spaces.

To manage the long term visual and landscape character impacts, the final urban design and landscape plan would be finalised during detailed design and in consultation with the local community (OpV06). The landscaping works for the project would include:

- At the western surface works, around:
  - 1,000 mature trees (over 25 litre pot size)
  - 2,000 trees as part of massed planting areas (around 150 millimetre pot size)
  - Five hectares of landscaped areas
- At Arncliffe, around:
  - 50 mature trees (over 25 litre pot size)
  - 0.5 hectares of landscaped areas across Bexley and Arncliffe
- St Peters interchange and local road upgrade areas, around:
  - 1,750 mature trees (over 25 litre pot size)
  - 2,000 trees as part of massed planting areas (around 150 millimetre pot size)
  - 12 hectares of landscaped areas (excluding future Sydney Gateway and the future M4–M5 Link works).

Further information can be found in Chapter 14 (Visual impacts and urban design) of the EIS (and as revised by **Chapter 8** (Revised summary of environmental management measures) of this report).

5.13.3 Operational landscape character design

499 submitters raised issues regarding impacts to landscape character and design.

Issue description – landscape character impacts on Euston Road

Submissions raised concerns about potential visual and landscape character impacts of the project on Euston Road including impacts associated with the removal of trees along Euston Road, and the 10 metre setback road reserve after road widening.

Response

The upgrade to Euston Road would have visual and landscape character impacts as a result of the impacts to the edge of Sydney Park, which would require the removal of a number of mature street trees. These impacts are identified in Section 14.3.2 (Visual impacts and urban design) and Appendix K (Technical working paper: Landscape character and visual impact) of the EIS.

Although the project would necessitate the loss of some vegetation along Euston Road, all feasible and reasonable design measures have been applied to minimise the extent of vegetation removal required for the local road upgrade works.

The landscape design of the project has been developed with the aim of reinstating a landscape and visual outlook comparable to the existing environment. This would include plantings of *Melaleuca quinquenervia* trees to retain a similar character to that provided by the existing vegetation.

Photomontages of the upgraded Euston Road in Figure 6-102 and Figure 6-103 in Appendix K (Technical working paper: Landscape character and visual impact) of the EIS show the anticipated landscape character and visual outcomes at project opening and 10 years later, respectively. The photomontages and the accompanying visual impact assessment demonstrate that potential visual and landscape impacts generated by the widening of Euston Road would be minimised and managed within acceptable limits through the proposed landscape character design for the project.

At present, the pavement on the western side of Euston Road is fairly regular. However its width does not adequately accommodate a shared pedestrian and cycle zone. Street tree plantings on the western side are generally consistent and feature a mature canopy. The path on the eastern side of Euston Road is irregular in width and quality.

The project works along Euston Road would create a dedicated shared path on the western side of adequate width to accommodate both pedestrian and cycle movements. The shared path would be separated from the roadway through a landscaped verge. Through further investigation of lane widths, Roads and Maritime would determine whether elements of the existing street trees on the western side can be retained. The eastern side would include street tree plantings where possible, with the remainder of the street retaining the existing trees.

Pedestrian connectivity would be enhanced through the installation of dedicated crossings at signalized intersection, none of which exist at present.

Roads and Maritime would also investigate during detailed design the opportunities to reduce the width of Euston Road by way of land width reduction and the removal of the central turning lane. This may provide further opportunities to avoid impacts on mature trees along this road, as well as the potential for additional landscape treatment to increase verge spaces as a result of the reduction in road spaces (refer to **Section 7.2** (Preferred Infrastructure Report) of this report).

Issue description – landscape character impacts on Sydney Park

Submissions raised concerns about the potential impacts to the landscape character of the project to Sydney Park and the surrounding suburbs. Concerns included:

- Sydney Park is being sacrificed for road infrastructure, and views to and from the park would become dominated by roads and traffic
- A reduction in access to, and enjoyment of, the eastern and southern park perimeters
- Partial closure leading to a lack of upkeep and a place for undesirables to congregate.

Response

The visual and landscape impact assessment presented in the EIS demonstrates that the landscape impacts of the project in and around Sydney Park can be effectively mitigated and managed through well designed landscaping. Around 0.2 hectares of land within Sydney Park, or about 0.6 per cent of the current area of the park, would be occupied by permanent project infrastructure. The majority of this land would be used for the provision of pedestrian and cyclist infrastructure, to enhance connectivity in and around Sydney Park.

There is currently a pedestrian footpath on the southern side of Sydney Park Road that is of good quality. Semi mature trees currently line the street.

The project would continue the shared path of Euston Road on the southern side of Sydney Park Road up to the extent of the local road upgrade works. This would complement the existing cycle route in this location and also better accommodate both pedestrian and cycle movements through increased path width. A crossing at the intersection of Sydney Park Road and Euston Road would provide a new connection for pedestrians and cyclists in this location.

Roads and Maritime would investigate during detailed design the opportunities to reduce the width of Euston Road by way of land width reduction and the removal of the central turning lane. This would assist in minimising impacts to Sydney Park during project operation. The three metre wide shared path would also be provided to the curtilage of Sydney Park, extending from Barwon Park Road around to a point opposite Mitchell Road at Alexandria, to connect with the existing shared path network in and around Sydney Park.

However as identified in Section 14.3.2 (Visual impacts and urban design) and Appendix K (Technical working paper: Landscape character and visual impact) of the EIS, the project has the potential to affect views from Sydney Park through adjacent surface works along Campbell Street, Euston Road and at the St Peters interchange. The assessment recognises the high sensitivity of Sydney Park to changes in landscape character, and the anticipated high magnitude of change in the local landscape character as a result of local road upgrade works along Euston Road and Campbell Street. Recreational receivers using Sydney Park were recognised as typically having a high sensitivity to the changes that would occur in these areas. However, only a small portion of areas of Sydney Park would have views to these changes, as much of the park has an inwards focus, and these changes would be somewhat screened by vegetation fringing the park and further diminished as the landscaped vegetation matures. As such, the assessment considered visual impact rating to be moderate.

There is significant opportunity to mitigate these impacts through well-designed and effective landscape treatments. The effect of this mitigation opportunity is demonstrated through the photomontages provided as Figure 6-85 (Campbell Road, 10 years after opening), Figure 6-88 (corner of Barwon Park Road and Campbell Road, 10 years after opening), Figure 6-100 (corner of Burrows Road and Campbell Road, 10 years after opening) and Figure 6-103 (Euston Road, 10 years after opening) in Appendix K (Technical working paper: Visual impact) of the EIS. The photomontages show a significant softening of the interface between Sydney Park and the local road upgrades, achieved through visual screening and development of a landscape character more sympathetic to a public recreational area as a result of landscaping treatments.

The landscaping approach for the project would be further developed during detailed design, and documented in the final Urban Design and Landscape Plan for the project. The overall design intent for local roads is to create a series of tree-lined streets that offer amenity for local residents, create a high quality environment for pedestrians and cyclists, and integrate the local landscape with adjacent open space and parkland. Tree and landscape plantings would be designed to match City of Sydney guidelines. Vegetation and tree plantings would be used to create a sense of visual separation for pedestrians and cyclists from the road edge.

Significant new areas of open space would also be created around the St Peters interchange as a result of the project, as detailed in Chapter 14 (Visual impacts and urban design) in the EIS. A master plan solution has been developed, encompassing the entire interchange site and ensuring its integration with surrounding areas. The project would therefore allow the extension of Sydney Park parklands further south, providing much needed open space for a growing population. Featuring landscape mounds, the design of the interchange parklands would continue the features of Sydney Park. This space would be accessed from shared paths in the east connecting to Sydney Park or via a dedicated entrance at the corner of Canal Road and Princes Highway. New open space would feature a mixture of open turf interspaced with garden beds and large trees.

Landscape mounds within the interchange would have sufficient height to enable park users to take advantage of views to the Sydney central business district, Sydney Airport and surrounding neighbourhoods. This design would allow future interventions to meet the needs of the community in a similar manner to the ongoing evolution of Sydney Park.

As part of landscape works for the project in the St Peters interchange and local road upgrades area, the project would include:

- Planting of around 1,750 mature trees (over 25 litre pot size) and around 2,000 trees as part of massed planting areas (around 150 millimetre pot size)
- Around 12 hectares of landscaped areas (excluding future Sydney Gateway and M4–M5 Link works).

All publicly-accessible parts of the project would be designed and implemented with the aim of ensuring safety and security. Design of publicly-accessible parts of the project would take into account the guidance provided by the Safer By Design program managed by the NSW Police Force and *Crime Prevention and the Assessment of Development Applications* (DUAP, 2001), and the four principles of Crime Prevention Through Environmental Design (CPTED), being:

- Surveillance
- Access control
- Territorial reinforcement
- Space management.

The design guidelines *Designing to Minimise Vandalism* (Final Draft) (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.

Issue description – landscape character impacts on St Peters

Submissions raised concerns about the potential impacts of the project to the landscape character on the broader St Peters area.

Response

The project has been designed to minimise its visual impacts by situating project elements within or adjacent to major transport corridors, where possible. Project elements have been designed with consideration of the surrounding areas and landscape treatments have been proposed in order to reduce the visual impacts of new infrastructure. Despite this, some landscape character impacts would remain in the broader St Peters area.

Five landscape character zones have been identified for the St Peters interchange and local road upgrades area. These are described in detail in Table 14-7 of the EIS and were assigned as follows:

- Residential
- Industrial
- Recreational
- Transport corridor
- Commercial corridor.

The St Peters interchange lies within the industrial landscape character zone. The proposed changes would comprise a significant change to the character of the site, and therefore a high change to the landscape character zone. Areas of parkland, as well as new built forms and associated landscaping would be new elements with positive implications for the existing industrial landscape.

The landscape character impact assessment undertaken for the project and summarised in Table 14-14 of the EIS concluded that although the overall impact ratings for the surrounding zones lie between moderate and moderate-low, these ratings are largely associated with the sensitivity of the individual landscape character zones. The greatest magnitude of change would be experienced by the industrial landscape character zone, and the transport corridor landscape character zone, both of which lie partly within or adjacent to the St Peters interchange.

The St Peters interchange lies within the industrial landscape character zone. The proposed changes in this zone – including new areas of parkland, as well as new built forms and associated landscaping – would have a significant positive impact on the character of the interchange site.

To achieve a lasting and cohesive urban design for the St Peters interchange area, the overarching design strategy for the entire WestConnex project would include a focus on unifying and shaping the different stages of the project, including the M5 East Motorway, the future Sydney Gateway and the M4–M5 Link. The following measures would be consistent with this design strategy at the St Peters interchange:

- Close the former Alexandria Landfill
- Return surplus lands to the community as public open space, and to allow separate future redevelopment and other permissible land uses
- Provide an extensive green volume of vegetation to compete with and soften the scale of the proposed multi-level interchange
- Establish of a tall, established tree canopy cover to not only soften the scale of the proposed infrastructure, and to provide a counterpoint and extension of the green open space from Sydney Park
- Design the St Peters motorway operations complex to enhance the existing street character while also presenting a cohesive set of architectural buildings.

These measures would allow for future stages of the interchange to adopt similar approaches to materials and detailing to achieve overall project cohesion and an integrated 'whole of project outcome.'

At present the pedestrian and cycling network in and around St Peters is fragmented, with a number of missing links, infrastructure of varying quality and a lack of safe, convenient crossings. For the local road upgrades, the project would create a series of tree-lined local streets offering amenity for local residents, creating a high quality environment for pedestrians and cyclists, and integrate the local streetscape with adjacent open space and parkland, particularly in the vicinity of Sydney Park.

The design would incorporate a series of feature pedestrian and cycleway bridges to increase connectivity. This connectivity would provide active transport links linking Sydney Park, Camdenville Park, Simpson Park and the open public space within the St Peters interchange, as well as allowing for future connections to the Sydney Gateway and active transport links along Alexandra Canal.

Tree and landscape plantings would be designed to match City of Sydney, Botany Bay and Marrickville Council guidelines, while vegetation and tree plantings would be used to create a sense of visual separation for pedestrians and cyclists from the road edge. All local road upgrades that form part of the New M5 project would be treated with a combination of footpaths, shared footpath / cycleways or dedicated cycleways. These paths would provide safe accessibility for residents, creating either new active transport routes or improving existing narrow and fragmented / dilapidated paths. A number of new crossings are also included within the New M5 project which would aid active transport safety and accessibility

Detailed measures to manage landscape character impacts resulting from the project would be included in the final Urban Design and Landscape Plan for the project. The plan would include landscape plans and final plant species for the eastern surface works, including the St Peters interchange and local road upgrades. Community consultation would be undertaken during the finalisation of this plan.

Issue description – landscape character and general visual impacts

Submissions raised concerns about the general landscape character impacts of the proposal, claiming that the design is out of context and inconsistent with current aesthetics.

Response

Urban design, landscape character and visual amenity impacts due to the project were assessed as per the *Environmental Impact Assessment Practice Note: Guidelines for Landscape Character and Visual Impact Assessment* (Roads and Maritime, 2013b) as detailed in Chapter 14 of the EIS (Visual

impacts and urban design). For the purposes of this assessment, the project corridor was divided into separate areas (western surface works, Bexley Road surface works, Arncliffe surface works, and St Peters interchange and local road upgrades). Landscape character zones were then assigned as follows:

- Residential
- Industrial
- Recreational
- Transport corridor
- Urban centre
- Commercial corridor.

This assessment predicted that the operation of the project would result in impacts on existing landscape characters within the project corridor ranging from negligible to high. Recreational landscape characters within the western surface works, Bexley Road surface works, and the Arncliffe surface works are predicted to be the most affected, experiencing a high-to-moderate level of impact. These are locations where greater intervention into open space areas would occur.

The project would deliver around 14 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.

Throughout the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. Following exhibition of the EIS and in response to submissions, additional work has been undertaken to build on the work completed to date, and to ensure pedestrian and cyclist facilities are consistent with existing State and local government policies and strategies. The outcomes of this additional work are further described in **Section 5.5.2** of this report.

New active transport infrastructure in the St Peters, Mascot and Alexandria areas would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure. The active transport elements being provided as part of the project would also support and enable future pedestrian and cyclist connectivity opportunities. These would include:

- Providing opportunities for connection to a possible future extension of the Alexandria Canal cycleway by City of Sydney
- Design of the Alexandra Canal bridge such that it would not preclude a future connection to a path on the western side of the Alexandria Canal
- Design to allow for future connection to active transport infrastructure associated with WestConnex Stage 3 (M4–M5 Link)
- Allowing for potential future connection to the Princes Highway from Canal Road or into bike friendly roads in lanes running parallel with Princes Highway
- Allowing for a future gateway and connector to Alexandria Canal cycleway near Tempe Reserve and further west to Cooks River cycleway (the project is a component of the overall strategic link between the inner west and the Botany Precinct)
- Offering active transport opportunities to future residential developments in the area through Euston Road improvements and improvements around Barwon Park Road
- Enabling future improvements in the Marrickville area to further integrate the network
- Enabling possible future improvement to Barwon Park Road (by reducing road use to one lane and reducing traffic volume).

Pedestrian and cyclist connectivity is described further in **Section 5.5.2** of this report.

As further detailed in Chapter 14 (Visual impacts and urban design), the WestConnex Urban Design Framework provides specific urban design direction for the development and delivery of WestConnex in the form of design objectives. An Urban Design Review Panel has been formed to oversee development of urban and landscape design for the project. The Panel would make recommendations in relation to architecture, urban and landscape design and artistic aspects of the project.

As detailed in Chapter 14 (Visual impacts and urban design) of the EIS, a final urban design and landscape plan would be prepared in consultation with the New M5 Urban Design Review Panel, local councils within the project corridor and the local community. The plan would include (but not be limited to):

- The architectural treatment of the ventilation facilities, which would be informed by the functional requirements and the design principles detailed in the New M5 Urban Design Report
- Landscape plans and final plant species for the western surface works, Bexley Road motorway operations complex, Arncliffe motorway operations complex, the St Peters interchange and local road upgrades
- The artwork strategy for the Kindilan underpass (refer to Section **5.13.7** of this report)
- Consideration of the outcomes of the Safety in Design review of the project (environmental management measure OpVO6).

The New M5 project has already constituted a design review panel as detailed in the urban design and landscape report. The panel membership as detailed in the report would be supplemented by other experts, including local councils, on an as-needs basis. The Panel meets approximately monthly and the agenda would be based on the design development program. Reporting to the Project Director, the panel would make recommendations and ensure design cohesion as well as innovative ideas are considered in the development of the urban design components.

Overall the EIS has demonstrated that landscape character impacts resulting from the project would be managed to an appropriate level of impact.

Issue description – landscape character impacts from transparent noise walls

Submissions raised concerns about the potential landscape character impacts of the project around Canterbury Golf Course, Beverly Grove Park and Tallawalla Street Park, including the impacts to residents and a concern that residents have not been prioritised. Specific concerns included privacy and requests for trees to be of a mature variety along residential property lines.

Response

The operation of the project would require the potential use of the following sections of transparent noise wall:

- By the Kingsgrove motorway operations complex (MOC1), a noise barrier around five metres high is being considered for construction adjacent to the M5 East Motorway, between Kooemba Road and Beverly Grove Park, of which the top three metres would be transparent
- At Beverly Grove North, a transparent noise barrier around four metres high is being considered for construction adjacent to the M5 East Motorway between Garema Circuit and the eastern corner of Canterbury Golf Course
- Five to 6.5-metre high transparent noise barriers are being considered for attachment to the back of barriers along the outermost flank of the northernmost and southernmost Kindilan underpass extension bridge structures.

The project would result in residential landscape character impacts ranging between low, moderate, and moderate-to-low. The design of noise barrier at the western surface works would be confirmed during detailed design and in consultation with the local community. This may consist of noise mounds and barriers (or a combination of both) and with consideration to the provision of accessible open space at Beverly Grove Park and a landscaped outlook (environmental management measure OpVO7).

It is considered that with this consultative approach to landscape character impacts in these areas, landscape character impacts as a result of noise barriers in the western surface works area would be managed to an acceptable level of impact

Issue description – changed character of Alexandria

Submissions raised concerns about impacts of the project on the character of Alexandria, including parks and houses, as well Camperdown.

Response

The local road upgrades are partially within the suburb of Alexandria. These areas contain a mix of industrial, commercial, residential and open space (Sydney Park). The suburb of Camperdown lies outside the project footprint.

The landscape character assessment for the current project (refer Appendix L of the EIS) was undertaken to consider the changed landscape character impacts to suburbs located within the current project footprint. An assessment of the impacts to landscape character in suburbs impacted by the M4–M5 Link (such as Camperdown where relevant), including any cumulative impacts resulting from other projects, would be undertaken as part of the future M4–M5 Link assessment process.

In terms of project impacts, the local road upgrades are partially within the suburb of Alexandria. However the suburb of Camperdown lies outside the project footprint. These areas contain a mix of industrial, commercial, residential and open space (Sydney Park).

New active transport infrastructure in Alexandria would significantly improve and encourage active transport use for commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure.

As outlined in Chapter 14 of the EIS (Visual impacts and urban design), where the local road upgrades pass through land zoned for infrastructure, mixed use and light industrial, the change in character would be in keeping with the land use and desire to 'maintain access and connectivity between local centres of employment and economic activity.' Where the widened local roads pass through land zoned residential or adjacent to public recreation land, the character of the new road is consistent with the nature of this area as a road reserve.

To achieve a lasting and cohesive urban design strategy for the overall St Peters interchange, focus would be on unifying and shaping the different stages of the project, including the M5 East Motorway, the future Sydney Gateway, and the WestConnex M4–M5 connection. The following objectives would allow design strategy to be implemented at the St Peters interchange:

- Close the former Alexandria landfill
- Return surplus lands to the community as public open space, and to allow separate future redevelopment and other permissible land uses
- Provide an extensive green volume of vegetation to compete with and soften the scale of the proposed multi-level interchange, creating an urban forest
- Promote the use of a tall, established tree canopy cover to not only soften the scale of the proposed infrastructure, but also provide a counterpoint and extension of the green open space from Sydney Park
- Design the St Peters motorway operations complex to enhance the existing street character whilst treated as a cohesive set of architectural buildings.

The design would allow for future stages of the Interchange to adopt similar approaches to materials and detailing to achieve overall project cohesion and an integrated 'whole of project outcome'.

The assessment detailed in Chapter 14 of the EIS (Visual impacts and urban design) predicted that the operation of the project would result in residential landscape character impacts ranging from moderate-to-low to moderate for residential, industrial, recreational, transport corridor and commercial corridor receivers.

Large areas of new tree planting would be incorporated on both sides of the ramps and above the portals to present a continuous green canopy. As specified in Chapter 14 of the EIS, opportunities to maximise the green canopy throughout the local road upgrades at Peters with tree planting in medians where safety barriers and / or speed limits permit would also be explored during detailed design, and implemented where reasonable and feasible (environmental management measure OpV10).

The EIS has shown that the character of suburbs surrounding the St Peters interchange and local road upgrades would not be significantly impacted.

Issue description – changed character of King Street, Newtown

Submissions raised concerns about impacts of the project on the unique character of King Street, Newtown, and surrounding streets.

Response

King Street, Newtown is in the near vicinity of the St Peters interchange and local road upgrades area.

The project does include active transport elements which would provide enhanced connections between Mascot Town Centre to Newtown and Marrickville. This piece of community infrastructure traverses a number of local government boundaries as well as connecting significant regional open space areas such as Sydney Park.

The project would not modify King Street, or change speed limits or on-street parking arrangements. Traffic modelling (refer Chapter 9 Traffic and transport) has indicated that there would be some change in traffic volumes along King Street in 2021 and 2031 as a result of the project, consisting of increases or decreases. In the cases of the expected increases, this would be in the order of around 280 vehicles by 2031 in the opposite direction to the dominant morning peak hour traffic. The increases are also within the design carrying capacity of the road. As such, the project is not expected to change the unique character of King Street, Newtown.

However Roads and Maritime is committed to development and implementation of the King Street Gateway in consultation with relevant councils, and which may include the re-design of the intersection of King Street and Sydney Park Road at St Peters, as well as works at the May Street and Princes Highway intersection at St Peters, and the Mitchell Road and Sydney Park Road intersection at Alexandria.

However any future proposal to reduce the capacity of King Street would be a separate project which would need to be assessed on its own merits, including traffic modelling and a full analysis of access and parking implications, as well as liaison with all relevant stakeholders and a detailed cost benefit analysis.

Issue description – loss of character to city of villages

Submissions raised concerns about the potential loss of character to Sydney suburbs generally, including to Sydney's image as a city of villages.

Response

Urban design, landscape character and visual amenity impacts as a result of the project were assessed as per the *Environmental Impact Assessment Practice Note: Guidelines for Landscape Character and Visual Impact Assessment* (Roads and Maritime, 2013b) as detailed in Chapter 14 of the EIS (Visual impacts and urban design). For the purposes of this assessment, the project corridor was divided into separate areas (western surface works, Bexley Road surface works, Arncliffe surface works, and St Peters interchange and local road upgrades). Landscape character zones were then assigned based on the predominant land form.

This assessment predicted that the operation of the project would result in impacts on existing landscape characters within the project corridor ranging from negligible to high. Recreational landscape characters within the western surface works, Bexley Road surface works, and the Arncliffe surface works are predicted to be the most affected, experiencing a high-to-moderate level of impact. All other types of landscape character zones (residential, urban centre, industrial, recreational,

transport corridor, infrastructure or commercial) would experience negligible to moderate landscape character impacts only.

The project would deliver around 14 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.

Throughout the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. Following exhibition of the EIS and in response to submissions, additional work has been undertaken to build on the work completed to date, and to ensure pedestrian and cyclist facilities are consistent with existing State and local government policies and strategies. The outcomes of this additional work are further described in **Section 5.5.2** of this report.

Additional green and recreational spaces would be created during the operation of the project, and it can be concluded that the project would not have significant impacts on the character of Sydney as a 'city of villages'.

Issue description – clearways in Newtown

Submissions raised concerns about the visual impact of permanent clearways in Newtown.

Response

As outlined in Chapter 7 (Consultation), existing clearways in King Street at Newtown would not be extended as part of the project.

Issue description – character changes from road widening

Submissions raised the concerns over road widenings so close to residential areas, including the concern that road widening and narrowed pedestrian access may be out of character.

Response

Chapter 14 (Visual impacts and urban design) outlines the landscape character impacts to the project corridor as a result of road widenings.

In the St Peters interchange and local road upgrades area, operational changes would include the widening of Campbell Road, Campbell Street and Euston Road. The widening of Campbell Road and Campbell Street would result in visually significant character changes within these road corridors. Where the road widening passes through land zoned RE2 Low Density Residential and adjacent to RE1 Public Recreation (i.e. Campbell Street), the character of the new road would be consistent with the nature a road reserve in a residential area. Views from the north-east would also be changed significantly in terms of the character and scale of the development, particularly with regard to the widening of Campbell Road.

Campbell Street contains footpaths immediately adjacent to the northern and southern sides of the road, which is of varying quality. At present the width is varying with some sections only 1.2 metres wide. There are no street trees or dedicated cycling facilities.

As part of the project, pedestrian footpaths would feature on both sides of the street, with consistent width and paving materials. A dedicated cycleway would be constructed on the northern side of the road and street trees would line the both sides of the street. At Simpson Park the street tree canopy would be selectively planted to ensure the existing figs within the park are featured. Both the pedestrian footpaths and cycleway would be separated from the road via a combination of street trees and landscape verges.

At present the pavement on the western side of Euston Road is fairly regular, however its width does not adequately accommodate a shared pedestrian and cycle zone. Street tree plantings on the western side are generally consistent and feature a mature canopy. The path on the eastern side of Euston Road is irregular in width and quality.

The project works along Euston Road would create a dedicated shared path on the western side of adequate width to accommodate both pedestrian and cycle movements. The shared path would be

separated from the roadway through a landscaped verge. Through further investigation of lane widths, the Proponent would determine whether elements of the existing street trees on the western side can remain. The eastern side would include street tree plantings where possible, with the remainder of the street retaining the existing trees.

Pedestrian connectivity would be enhanced through the installation of dedicated crossings at signalized intersection, none of which exist at present.

In the western surface works area, operational changes would include a general widening of the M5 East Motorway. The widening of the M5 East Motorway and the associated ancillary elements (noise barriers, tolling gantry, signage and landscaping) would be visually consistent with the existing and future desired character of the area within the SP2 Infrastructure zoned land. The western surface works area is predominantly flanked by RE1 Public Recreation zoned land, which visually buffers the residential (and to some extent the industrial) land beyond. As such, the project would have a minimal visual impact on these areas, and therefore the overall character of 'a suburban setting with pockets of bushland' would not be significantly affected.

The width of pedestrian and shared pathways would meet the relevant standards. Where the project modifies existing local roads, the project aims to improve accessibility and provide shared or separated cycle ways to enhance active transport opportunities. Overall, pedestrian and cycle access across would be improved during project operation. Many streets within the project footprint currently have narrow footpaths in close proximity to traffic (e.g. Campbell Street), with no dedicated off-road cycling provisions.

Issue description – tree removal

Submissions raised concerns over the removal of trees, specifically:

- The existing seven Port Jackson Fig trees (around 100 years old) on Euston Road provide a visual, auditory and psychological buffer and to remove them would adversely impact the residents of Euston Road
- Valued Paperbark trees would be replaced by road / traffic
- The loss of semi and mature trees near Sydney Park would impact on visual amenity and character
- Visual amenity would be impacted through the removal of trees at Beverly Grove Park, Sydney Park and other parks.

Response

The construction footprint has been developed to avoid and/or minimise impacts on mature vegetation and open space where possible. However, the project would result in the removal of some vegetation, and the temporary or permanent loss of some open space. Opportunities to further reduce the project footprint and reduce the extent of impacts on established vegetation would be considered during detailed design.

Notwithstanding these measures, the project would have short term impacts on the visual character of these spaces. To manage temporary visual impacts, the following environmental management measures would be implemented:

- Existing vegetation around the perimeter of the construction compounds would be retained where feasible and reasonable (V01)
- Revegetation and landscaping would be undertaken progressively (V03)
- Landscape planting would use fast growing species where reasonable and feasible (V02). This would soften views of construction sites, particularly for compounds located within public recreational spaces.

To manage the longer term visual and landscape character impacts, the final Urban Design and Landscape Plan would be finalised during detailed design and in consultation with the local community (OpV06). The landscaping works for the project would include the following elements:

- At the western surface works, around:

  - 1,000 mature trees (over 25 litre pot size)
  - 2,000 trees as part of massed planting areas (around 150 millimetre pot size)
  - Five hectares of landscaped areas
- At Arncliffe, around:
  - 50 mature trees (over 25 litre pot size)
  - 0.5 hectares of landscaped areas across Bexley and Arncliffe
- At the St Peters interchange and local road upgrade areas, around:
  - 1,750 mature trees (over 25 litre pot size)
  - 2,000 trees as part of massed planting areas (around 150 millimetre pot size)
  - 12 hectares of landscaped areas (excluding future Sydney Gateway and the future M4–M5 Link works).
  - Further information can be found in Chapter 14 (Visual impacts and urban design) of the EIS (and as revised by Chapter 8 (Revised summary of environmental management measures) of this report).

During detailed design, Roads and Maritime would investigate the option to further reduce the width of the upgraded Euston Road, which may provide further opportunities to avoid impacts on mature trees along this road (refer to **Section 7.2** (Preferred Infrastructure Report) of this report). This may be achieved either through a reduction in lane width or through the removal or reduction of the central turning lane. Options would be considered in the context of road safety, network performance and implications on property access.

Issue description – large transport trucks

Submissions raised the concerns about the project resulting in increased large truck movements which may affect the urban environment and areas of heritage significance.

Response

Increased road traffic has the potential to impact on amenity through increased traffic volumes, increased noise and vibration, and reduced air quality from vehicle emissions.

During operation of the project, traffic volumes would increase around the St Peters interchange. The increase in traffic volumes would result in increased noise levels for residents located adjacent to these roads.

A total of 133 day-time receiver locations and 145 night-time receiver locations have been identified as likely to experience road traffic noise above applicable assessment criteria in 2031 with the implementation of the project. These receiver locations are mainly located around the St Peters interchange, including on Euston Road. In addition, two buildings within St Peters Public School have been identified as likely to experience noise levels that exceed the internal noise criteria with windows open. One of these buildings is in fact the St Peters Community Pre-school, with frontage at 18 St Peters Street, St Peters and Church Street (refer to **Chapter 8** of this report). None of the receivers are located on King Street in Newtown.

Consistent with the *NSW Road Noise Policy* (EPA, 2011), all feasible and reasonable mitigation measures must be considered to reduce the extent to which road traffic noise exceeds applicable assessment criteria at these 145 receiver locations and two school buildings. The identification and evaluation of feasible and reasonable mitigation measures for these locations is included in section 12.5.2 of the EIS and includes a combination of at-source treatments (such as low noise pavement selection), noise barriers and potential at-property acoustic treatments. These mitigation measures would be confirmed during detailed design of the project, including confirmation of receiver locations that would be eligible for consideration of at-property acoustic treatments.

In relation to air quality, the project is expected to result in lower total pollutant levels across the project corridor. Specifically, the project is anticipated to redistribute the impacts associated with emissions derived from vehicles using surface roads. For much of the community this would result in

no change or a small improvement (i.e. reduced concentrations and fewer health impacts). However, for some areas located near key surface roads a small increase in pollutant concentrations may occur. Potential health risks associated with changes in air quality (specifically nitrogen dioxide and particulate matter) within the local community have been assessed in the EIS and are within acceptable limits.

Impacts to urban environments resulting from traffic movements during project operation are overall considered to be at acceptable levels.

5.13.4 Operational visual impact

291 submitters raised issues regarding visual impacts of the project during operation.

Issue description – visual impacts from St Peters interchange and local road upgrades

Submissions raised concern about the visual impacts from the St Peters interchange. Specific concerns included:

- General visual impacts from the St Peters interchange to neighbourhoods and park areas
- Visual impacts from the interchange within a residential setting would change aesthetics
- Confirmation that the design of the St Peters interchange would be consistent with the design presented in the EIS
- The scale and design of the interchange, and its close proximity to residential streets
- Above-ground roads and associated infrastructure
- Footpaths
- Cycleways.

Response

The design of the St Peters interchange as constructed would be consistent with the design presented in the EIS. The detailed design process would be used to further develop and refine the design of the St Peters interchange and other components of the project, within the broad design parameters outlined in the EIS.

Chapter 14 (Visual impacts and urban design) and Appendix K (Technical working paper: Visual impact) of the EIS present an assessment of the visual and landscape impacts of the project, including in relation to the St Peters interchange and surrounding visual receivers. The outcomes of the visual impact assessment are summarised in Table 14-15 of the EIS, and with respect to the St Peters interchange, the assessment concluded that:

- Potential visual impacts on industrial receivers would vary from low (Canal Road) to moderate-low (Burrows Road, near Gardeners Road Bridge)
- Potential visual impacts on residential receivers would be high (Campbell Road and Barwon Park Road)
- Potential visual impacts on recreational receivers would be moderate (Sydney Park)
- Potential visual impacts on road users would vary from moderate-low (Burrows Road, near Gardeners Road Bridge) to high-moderate (Campbell Road).

It is recognised that the introduction of major road infrastructure such as the St Peters interchange into the local landscape has the potential to substantially alter the visual and landscape context, particularly for more sensitive residential and recreational receivers. It does, however, also offer the opportunity through careful design to improve the local landscape, including replacement of an existing industrial aspect across the Alexandria landfill site width.

At present the pedestrian and cycling network in and around St Peters is fragmented, with a number of missing links, infrastructure of varying quality and a lack of safe, convenient crossings.

The St Peters interchange would include the creation of new dedicated cycle paths, shared paths, footpaths and crossings to improve active transport connections. All local street interventions within the New M5 project would be treated with a combination of footpaths, shared footpath / cycleways or dedicated cycleways. These paths would provide safe accessibility for residents, creating either new active transport routes or improving existing narrow and fragmented/dilapidated paths. A number of new crossings are also included within the New M5 project. These would aid pedestrian safety and accessibility. Furthermore the inclusion of dedicated cycle crossings at signals where cycleways traverse would create safe cycle routes.

The design of the St Peters interchange infrastructure and the landscaping strategy for the site have been developed with the aim of minimising visual and landscape impacts where feasible and reasonable, and to provide screening and softening of impacts through effective landscape treatments. The project design and landscaping strategy would continue to be developed during the detailed design phase in consultation with the New M5 Urban Design Review Panel, local councils along the project corridor and affected local communities. The outcomes of this process would be included in a final urban design and landscape plan for the project.

To achieve a lasting and cohesive urban design strategy for the overall St Peters interchange, focus would be on unifying and shaping the different stages of the project, including the M5 East Motorway, the future Sydney Gateway, and the WestConnex M4–M5 connection. The following objectives would allow design strategy to be implemented at the St Peters interchange:

- Close the former Alexandria landfill
- Return surplus lands to the community as public open space, and to allow separate future redevelopment and other permissible land uses
- Provide an extensive green volume of vegetation to compete with and soften the scale of the proposed multi-level interchange, creating an urban forest
- Promote the use of a tall, established tree canopy cover to not only soften the scale of the proposed infrastructure, but also provide a counterpoint and extension of the green open space from Sydney Park
- Design the St Peters motorway operations complex to enhance the existing street character whilst treated as a cohesive set of architectural buildings.

These measures would allow for future stages of the St Peters interchange to adopt similar approaches to materials and detailing to achieve overall project cohesion and an integrated ‘whole of project outcome’. The landscape approach in this area would focus on the creation of green volume and remediation of the former Alexandria landfill by creating an urban forest capable of competing with the scale of the St Peters interchange.

Overall, it is noted that the quality of the change to the St Peters interchange site is a positive visual impact. The integration of public open space within the interchange site provides beneficial views from surrounding receivers, and considered architectural finishes to buildings are also a positive outcome to the visual amenity of the site.

Issue description – general visual impacts from the project

Submissions raised concern about general visual impacts from project, requested that photomontages are prepared and considered, and expressed concern that visual representations of road and infrastructure presented in the EIS are misleading.

Response

Chapter 14 (Visual impacts and urban design) and Appendix K (Technical working paper: Visual impact) of the EIS include a detailed assessment of the potential visual and landscape impacts of the project, including numerous photomontages from different vantage points.

The project has been designed to limit its visual impact by situating project elements within or adjacent to major transport corridors. Project elements have been designed with consideration of the surrounding areas and landscape treatments have been proposed to reduce the visual impacts of new infrastructure. Despite this, visual impacts are likely to occur, particularly during construction due to the introduction of construction areas and large structures such as acoustic sheds.

Photomontages have been produced for the EIS and provide a representation of the project design features based on the current design. The design is subject to further detailed design.

Urban and landscape design is a key component of the project. A number of publications and guidelines have informed the urban design concept for the project. This concept is based on the following objectives as outlined in the *WestConnex Urban Design Framework* (Sydney Motorway Project Office, 2015):

- Leading edge environmental responsiveness
- Connectivity and legibility
- Place making
- Urban renewal and liveability
- Memorable identity and a safe, enjoyable experience
- A new quality benchmark.

Through the implementation of an overarching urban design vision and careful analysis of context, the project would integrate with and provide peripheral visual and landscape benefits for local and regional communities.

Issue description – visual impacts from noise barriers

Submissions raised concern about the visual impact of the transparent noise walls (barriers) and objected to the design which emphasises driver experience (views across Canterbury Golf Course, Beverly Grove Park and Tallawalla Street Park) at the expense of residents and pedestrians, including:

- Visual impacts from noise barriers, specific to Canterbury Municipal Golf Course, Beverly Grove Park and Tallawalla Street Park
- Requests that planting of mature trees near new noise walls along Beverly Grove Park and Tallawalla Street Park
- Requests that planting of mature trees near noise walls along Beverly Grove Park is undertaken to mitigate visual impacts
- Requests that natural-looking mounds covered in vegetation be used instead of transparent walls (including at Rosebank Avenue, Armitree Street and Glairns Street)
- Critically endangered woodland would be destroyed and replaced with a noise wall which would supposedly improve the motorist experience at the expense of pedestrian views.

Response

The assessment, as detailed in Chapter 14 of the EIS (Visual impacts and urban design), predicted that the western surface works of the project would result in residential landscape character impacts ranging from low, moderate, and moderate-to-low.

Existing noise barriers along the western surface works would be retained or relocated outside the construction and operational footprints of the project, at an equivalent height with the exception of the existing noise berm south of Beverly Grove Park. Due to space restriction and a desire to minimise the occupation of recreational areas, a noise barrier is currently proposed.

The potential use of transparent noise barriers has been identified in the visual and landscape character impact assessment for the project as an option to enhance visual connectivity and to improve the motorists' travel experience. However, the final design of noise barriers and other project urban design elements has not yet been finalised. It is recognised that design of noise barriers around the western surface works have competing considerations in relation to the visual context of motorists and local residential receivers.

The design of further noise attenuation at the western surface works would also be confirmed during detailed design and in consultation with the local community. This may consist of noise mounds and

barriers (or a combination of both) and with consideration to the provision of accessible open space at Beverly Grove Park and a landscaped outlook (environmental management measure OpVO7).

Further information can be found with respect to the noise and vibration impact assessment in Chapter 12 and Appendix J (Technical working paper: Noise and vibration) of the EIS.

Issue description – visual impacts from tunnel portals, ramps, ventilation facilities, concrete flyovers, interchanges, embankments, concrete viaducts and noise barriers

Submissions raised concerns regarding visual amenity impacts from tunnel portals, ramps, ventilation facilities, concrete flyovers, interchanges, embankments, concrete viaducts and noise barriers.

Response

The visual impacts of operational project infrastructure, including tunnel portals, ramps and ventilation facilities, on surrounding categories of receivers are assessed in Chapter 14 and Appendix K (Technical working paper: Landscape character and visual impact) of the EIS. The urban and landscape design is presented in Appendix L (Urban design report).

The most prominent, and potentially most visually intrusive, components of the project would include large and / or elevated aboveground infrastructure such as the St Peters interchange and the motorway operations complexes (including ventilation facilities). The location of tunnel portals and ramps below the surface of the ground in most cases would limit potential visual impacts to road users, and occasional occupants of land immediately around this infrastructure (such as recreational users of open space around the western surface works area or near the St Peters interchange). Around the western surface works area, new infrastructure including tunnel portals and ramps would be integrated into, and would be consistent with, the visual context of the existing motorway corridor.

The summary of potential visual impacts during operation of project presented in Table 14-15 of the EIS concludes that:

- Around the western surface works, including the western tunnel portals, tunnel ramps and the Kingsgrove motorway operations complex (MOC1), only pedestrians and cyclists using Beverly Grove Park would experience a high visual impact. All other visual receivers would be affected at a low to moderate level
- Most visual receivers around other motorway operations complexes, including the Bexley Road South motorway operations complex (MOC2), the Arncliffe motorway operations complex (MOC3), the St Peters motorway operations complex (MOC4) and the Burrows Road motorway operations complex (MOC5) would be impacted at a low to moderate level. The key exceptions would be:
  - Pedestrians and cyclists using the M5 Linear Park in relatively close proximity to the Bexley Road South motorway operations complex (MOC2) would experience a high visual impact
  - Residents near the intersection of Flora Street and Marsh Street would experience a moderate to high visual impact given the scale of the Arncliffe motorway operations complex (MOC3), including the associated ventilation facility, and absence of intervening structures. These residents can currently look directly across Marsh Street and the Kogarah Golf Course towards the motorway operations complex and ventilation facility
  - Pedestrians and cyclists using the Eve Street cycle path in relatively close proximity to the Arncliffe motorway operations complex (MOC3) would experience a moderate to high visual impact
- Residential receivers along Campbell Road and Barwon Park Road would experience a high visual impact, due to the scale of the St Peters interchange and their proximity to this infrastructure
- Road users along Campbell Road would experience a moderate to high visual impact from the St Peters interchange due to their proximity to this infrastructure.

The potential visual impacts of the project would be mitigated through measures outlined in Section 14.4 of the EIS and Section 7.2 of the technical working paper (as revised in **Chapter 8** (Revised environmental management measures) of this report). These measures would include:

- The architectural treatment of the ventilation facilities would be finalised prior to the commencement of construction and following consultation with surrounding communities
- The final architectural treatment for the facilities would be informed by the functional requirements and the design principles detailed in the Appendix L (Technical working paper: Urban design report) of the EIS. This would be documented in the final Urban Design and Landscape Plan for the project
- Maximise planting areas, where feasible, between public open space and infrastructure and include taller, screening vegetation
- Lighting design within motorway operations complexes, roadways, and on elevated pedestrian bridges (for example at St Peters interchange) to minimise the potential impacts of lighting to surrounding areas (particularly residential areas)
- Consider the use of street trees along both sides of the street (for example Campbell Road) that would provide screening of views of the project, including lighting from the carriageways.

To achieve a lasting and cohesive urban design strategy for the overall interchange, focus would be on unifying and shaping the different stages of the project, including the M5 East Motorway, the future Sydney Gateway, and the WestConnex M4–M5 Link. The following objectives would allow the design strategy to be implemented at the St Peters interchange:

- Close the former Alexandria landfill
- Return surplus lands to the community as public open space, and to allow separate future redevelopment and other permissible land uses
- Provide an extensive green volume of vegetation to compete with and soften the scale of the proposed multi-level interchange, creating an urban forest
- Promote the use of a tall, established tree canopy cover to not only soften the scale of the proposed infrastructure, but also provide a counterpoint and extension of the green open space from Sydney Park
- Design the St Peters motorway operations complex to enhance the existing street character whilst treated as a cohesive set of architectural buildings.

Appendix L (Technical working paper: Urban design report) of the EIS provides a detailed presentation of how these measures would be implemented through the urban design associated with the project. During the detailed design stage, work would be undertaken in consultation with the community to determine potential further landscape and architectural treatment of the project.

Issue description – ring road car parks

Submissions raised concerns that green space is being co-opted and removed for a ‘ring road car park.’

Response

The St Peters interchange would be located on land that is currently the site of the Alexandra landfill as demonstrated on Figure 6-4 of the EIS (Chapter 6 – Construction work). As such, minimal existing green space would be affected during the construction and operation of the St Peters interchange.

The operational design of the St Peters interchange would in fact increase green space and introduce green space in areas that are currently cleared / industrial land with minimal vegetation. Parts of the former Alexandria landfill site not required for the St Peters interchange would be rehabilitated and landscaped with the aim of providing these areas as additional public recreational space. This additional public recreational land would provide a positive contribution to the total supply of open space in the local area, and given its proximity to Sydney Park and new pedestrian and cyclist infrastructure, would represent a significant enhancement to existing park areas.

Issue description – visual impacts to heritage from new elements

Submissions raised concerns regarding visual impacts to heritage items and characteristics from new elements.

Response

Chapter 20 (Non-Aboriginal heritage) outlines those non-Aboriginal heritage items that would be visually impacted as a result of the project.

In the majority of cases, heritage items within the study area would experience either minor or negligible visual impacts, apart from the Alexandra Canal and the St Peters Brickpit Geological Site, which are predicted to experience significant visual impacts.

There is unlikely to be any significant changes to the outlook of the majority of heritage items as a result of the project. Further, visual impacts to affected heritage items would be reduced in part by distance and the screening effect of surrounding residential developments and proposed landscaping. It was, however, recognised that there would be alterations to the visual outlook from terraces located at 2-34 Campbell Road, St Peters, and landscape treatments would be investigated during detailed design to mitigate these impacts. Further, existing vistas and view lines from heritage items would be considered during detailed design and rehabilitation strategies sympathetic to the heritage item would be determined. In these cases, the overall heritage value of the heritage items would not be significantly impacted by the project.

Further information on the heritage impact assessment, with respect to visual impacts, is provided in Sections 14.3.1 and 14.3.2 of the EIS – Visual impact and urban design.

Issue description – vegetation loss

Submissions raised concerns regarding visual impacts from the loss of vegetation, including:

- Old trees and green spaces
- The row of trees on Campbell Road
- Cooks River Plain Scrub Forest.

Response

Clearance of vegetation would be unavoidable due to the required footprint of the project as detailed in Chapter 21 (Biodiversity) of the EIS. For the purposes of the EIS, a worst case construction footprint was assumed, which is larger in area than the subsequent operational footprint for the project, and which led to the conservative clearing estimates of around:

- 7.45 hectares of urban native and exotic vegetation
- 1.40 hectares of Broad-leaved Ironbark *Melaleuca decora* shrubby open forest on the clay soils of the Cumberland Plain, Sydney Basin Bioregion
- 1.82 hectares of Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
- 0.09 hectares of Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest in sandstone gullies of western Sydney, Sydney Basin

Notwithstanding, opportunities to avoid and minimise the extent of vegetation clearing would continue to be considered during detailed design of the project.

As detailed in Chapter 21 (Biodiversity) of the EIS, the removal of established vegetation would be minimised, where possible (environmental management measure BO2). Revegetation and landscaping is also planned to be undertaken to minimise lighting and other visual impacts from construction compounds (as opposed to impacts from diverted shared paths and along residential property lines), and would be required to be undertaken progressively (environmental management measure VO3) with the use of fast-growing species (as opposed to mature trees) where reasonable and feasible (environmental management measure VO2). Existing vegetation around the perimeter of the construction compounds would be retained where feasible and reasonable (environmental management measure V01).

More specifically, the landscaping works for the project would include:

- At the western surface works, around:

  - 1,000 mature trees (over 25 litre pot size)
  - 2,000 trees as part of massed planting areas (around 150 millimetre pot size)
  - Five hectares of landscaped areas
- At Arncliffe, around:
  - 50 mature trees (over 25 litre pot size)
  - 0.5 hectares of landscaped areas across Bexley and Arncliffe
- St Peters interchange and local road upgrade areas, around:
  - 1,750 mature trees (over 25 litre pot size)
  - 2,000 trees as part of massed planting areas (around 150 millimetre pot size)
  - 12 hectares of landscaped areas (excluding future Sydney Gateway and the M4–M5 Link works).

Issue description – chicanes near May Street terraces

Submissions suggested relocating the chicanes closer to the May, Bedwin and Council Street intersection to reduce the negative visual impacts to the local significance of heritage item LEP I273 May Street terraces, 119-105 May Street.

Response

Local road upgrades would encroach into some areas containing non-Aboriginal heritage items, including the street frontage of the Goodsell Estate Heritage Conservation Area, corner of Bedwin Road and May Street at St Peters (refer Figure 5-8 of the EIS Chapter 5 – Project description). These upgrades would occur adjacent to the 119-105 May Street terraces, which lie within the Goodsell Estate Heritage Conservation Area.

As outlined in Chapter 20 (Non-Aboriginal heritage), only minor, indirect visual impacts are predicted to occur to heritage items as a result of these local road upgrade works along May Street. Urban design and landscaping would be would be undertaken to manage visual impacts to non-Aboriginal heritage items, including the May Street terraces (environmental management measure NAH22). As such, while the consideration of relocating chicanes is not considered necessary, from a heritage perspective, the final design solution, required from a road safety and performance perspective, along May Street would be considering during detailed design.

Issue description – reduced visibility from smog

Submissions raised concerns around smog and reduced visibility from exhaust emissions, including near tunnel portals and at Sydney Park.

Response

Three pollutants for in-tunnel air quality - NO_2, CO and $PM_{2.5}$ (exhaust only, as visibility) were assessed in Chapter 10 of the EIS (Air quality). All tunnel projects rely instead on the primary approach of dilution of air pollution in the tunnel and effective dispersion though elevated outlets through ventilation systems. Tunnel design itself is significant, as avoiding large gradients and congested traffic conditions helps to minimise air quality impacts.

The project would reduce pollutant emissions, and therefore smog impacting visibility by including the following as part of the operational project:

- Minimal gradients. The main alignment tunnels would have a maximum gradient of four per cent. By comparison, the M5 East tunnel has a grade of up to eight per cent on the western exit, which causes trucks to slow down and increase emissions
- Large main line tunnel cross-sectional area (90 square metres). The tunnel would have a large cross-sectional area to reduce the pollutant concentration for a given emission into the tunnel volume, and to permit greater volumetric air throughput

- Increased height. The height of the New M5 tunnel (5.3 metres) would be significantly greater than that of the M5 East tunnel (4.6 metres). This would reduce the risk of incidents involving high vehicles blocking the tunnel and leading to disruption of traffic
- Ventilation system. The project ventilation system has been designed so that it would achieve some of the most stringent standards in the world for in-tunnel air quality and would be effective at maintaining local air quality. The design of the ventilation system would provide zero portal emissions
- Air quality monitoring. Ambient air quality monitoring would be conducted to validate the EIS predictions.

Issue description – impacts to Newtown and Alexandria

Submissions raised concerns around visual impacts to Newtown and Alexandria.

Response

In terms of project impacts, the suburb of Alexandria lies within the St Peters interchange and local road upgrades area, whilst the suburb of Newtown does not lie within the direct project footprint, but rather in the near vicinity of the St Peters interchange and local road upgrades area.

It is acknowledged that the widening of roads in St Peters and Alexandria near residential areas (such as Campbell Road and Campbell Street) would result in visually significant character changes within these road corridors. However, the character of the new road would be consistent with the nature a road reserve in a residential area.

An active transport connection from Mascot Town Centre to Newtown and Marrickville is included in the New M5 project. This piece of community infrastructure traverses a number of local government boundaries as well as connecting significant regional open space areas such as Sydney Park. New active transport infrastructure in the St Peters, Mascot and Alexandria precincts would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure.

The project would not modify King Street, or change speed limits or on-street parking arrangements. Traffic modelling (refer Chapter 9 (Traffic and transport) of the EIS) has indicated that there would be some change in traffic volumes along King Street in 2021 and 2031 as a result of the project, consisting of increases or decreases. In the cases of the expected increases, this would be in the order of around 280 vehicles by 2031 in the opposite direction to the dominant morning peak hour traffic. The increases are also within the design carrying capacity of the road. As such, the project is not expected to change the unique character of King Street, Newtown.

To achieve a lasting and cohesive urban design strategy for the overall St Peters interchange, focus would be on unifying and shaping the different stages of the project, including the M5 East Motorway, the future Sydney Gateway, and the WestConnex M4–M5 Link. This is further outlined in Chapter 14 (Visual impacts and urban design) of the EIS. The following objectives would allow design strategy to be implemented at the St Peters interchange:

- Close the former Alexandria landfill
- Return surplus lands to the community as public open space, and to allow separate future redevelopment and other permissible land uses
- Provide an extensive green volume of vegetation to compete with and soften the scale of the proposed multi-level interchange
- Promote the use of a tall, established tree canopy cover to not only soften the scale of the proposed infrastructure, but also provide a counterpoint and extension of the green open space from Sydney Park
- Design the St Peters motorway operations complex to enhance the existing street character whilst treated as a cohesive set of architectural buildings.

- The assessment detailed in Chapter 14 (Visual impacts and urban design) predicted that the operation of the project would result in residential landscape character impacts ranging from moderate-to-low to moderate for residential, industrial, recreational, transport corridor and commercial corridor receivers in relation to the operation of the St Peters interchange and local road upgrades
- Large areas of new tree planting would be incorporated on both sides of the northern ramps and above the portals to present a continuous green canopy and create a sense of green immersion for motorists upon entry to or exit from the tunnel at the St Peters interchange. Opportunities to maximise the green canopy throughout the local road upgrades at St Peters with tree planting in medians where safety barriers and / or speed limits permit would also be explored during detailed design, and implemented where reasonable and feasible (environmental management measure OpV10). This is specified in Chapter 30 of the EIS (Summary of environmental management measures).

Roads and Maritime is also committed to development and implementation of the King Street Gateway in consultation with relevant councils, and which may include the re-design of the intersection of King Street and Sydney Park Road at St Peters, as well as works at the May Street and Princes Highway intersection at St Peters, and the Mitchell Road and Sydney Park Road intersection at Alexandria.

However any future proposal to reduce the capacity of King Street would be a separate project which would need to be assessed on its own merits, including traffic modelling and a full analysis of access and parking implications, as well as liaison with all relevant stakeholders and a detailed cost benefit analysis.

Issue description – property specific light mitigation

A submission from a resident in Alexandria requested further information about mitigation that would be undertaken to minimise lighting impacts.

Response

Lighting design within motorway operations complexes, roadways, and on elevated pedestrian bridges would minimise the impacts of lighting to surrounding areas (particularly residential areas), for example through the use of cut-off, directed lighting and landscaping to minimise light spill and glare, as outlined in Chapter 30 of the EIS (Summary of environmental management measures). This includes consideration of residences along Campbell Road at Alexandria (environmental management measure OpV12). The community would be consulted during detailed design on the final urban design and landscape plan, which would include lighting design.

Issue description – Campbell Street noise wall

Submissions suggested that, with the land-take proposed in Figure 5-31 of the EIS, there would be ample space to build a noise wall that has acceptable urban design, visual amenity and overshadowing impacts.

Response

Consideration was given to the provision of a noise barrier along Campbell Street as a mitigation measure for increases in road traffic noise. However, it was not deemed possible to develop noise barrier and mounds and maintain access to the local street such as Brown Street and Florence Street as all roads connecting to Campbell Street would have needed to be terminated. Providing short noise barriers that run between streets would result in very limited noise reductions as the noise would still have propagated down the open streets.

Further work would be undertaken during the detailed design stage of the project to confirm any noise mitigation that would be incorporated in the design of the project. All noise mitigation would need to be considered at this stage, including low-noise pavements and noise barriers.

5.13.5 Operational urban design and landscaping

387 submitters raised issues regarding urban design and landscaping during operation.

Issue description – general urban design considerations

Submissions raised concerns that the current design:

- Lacks contemporary innovation and awareness of global transport trends
- Is not well connected with the natural environment
- Does not satisfy integration with local setting
- Does not maintain and enhance existing landscape characters and vegetation patterns
- Contains infrastructure that is going to be visually displeasing, replicating Californian road designs.

Response

Urban and landscape design is a key component of the project, as demonstrated through the detailed and well-developed urban design included in Appendix L (Urban design report) of the EIS. The urban and landscape design for the project has been developed with the aim of integrating the project into the natural and built environments and providing a contemporary, considered and cohesive design outcome. The urban and landscape design responds to the key objectives detailed in the *WestConnex Urban Design Framework* (Sydney Motorway Project Office, 2015):

- Leading edge environmental responsiveness
- Connectivity and legibility
- Place making
- Urban renewal and liveability
- Memorable identity and a safe, enjoyable experience
- A new quality benchmark.

The urban and landscape design for the project has also been developed in accordance with the guidance provided in *Beyond the Pavement* (RMS, 2014c) which places particular focus on the following principles:

- Integration with local setting – the design maintains and enhances existing landscape character and vegetation patterns
- Ecologically sound – the design uses local species from existing and adjoining plant communities and assists in protecting and recovering local biodiversity
- Add character and value – the design responds to and draws upon the existing landscape patterns of the area.

Figure 14-10 of the EIS (Chapter 14 – Visual impacts and urban design), provides an artist's impression of the proposed St Peters interchange. As part of the WestConnex Urban Design Framework, the St Peters interchange would:

- Form the main connector between stages and within the southern reaches of the CBD – denoted by its green appearance and unique portal design marking it as a major decision point within the M5 East Motorway journey
- Include local street upgrades which would improve pedestrian and cyclist connectivity and access to open space
- Involve the utilisation of a landfill site which is unsuitable for many other reuses
- Comprise a distinct portal design which would create an identity for the St Peters interchange
- Include heavily treed landscapes to reinforce the urban forest identify of the St Peters interchange.

To achieve a lasting and cohesive urban design strategy for the overall Interchange, focus would be on unifying and shaping the different stages of the project, including the M5 East Motorway, the future Sydney Gateway, and the WestConnex M4–M5 connection. The following objectives would allow design strategy to be implemented at the St Peters interchange:

- Close the former Alexandria landfill
- Return surplus lands to the community as public open space, and to allow separate future redevelopment and other permissible land uses
- Provide an extensive green volume of vegetation to compete with and soften the scale of the proposed multi-level interchange
- Promote the use of a tall, established tree canopy cover to not only soften the scale of the proposed infrastructure, but also provide a counterpoint and extension of the green open space from Sydney Park
- Design the St Peters motorway operations complex to enhance the existing street character whilst treated as a cohesive set of architectural buildings.

A final Urban Design and Landscape Plan would be prepared in consultation with the New M5 Urban Design Review Panel, local councils within the project corridor and the local community. The plan would include (but not be limited to):

- The architectural treatment of the ventilation facilities, which would be informed by the functional requirements and the design principles detailed in the New M5 Urban Design Report.
- Landscape plans and final plant species for the western surface works, Bexley Road motorway operations complex, Arncliffe motorway operations complex, the St Peters interchange and local road upgrades
- The artwork strategy for the Kindilan underpass
- Consideration of the outcomes of the Safety in Design review of the project (environmental management measure OpVO6).

Issue description – mature planting

Submissions requested mitigation of construction impacts through planting of mature trees in the following areas:

- Near new noise barriers, including noise barriers along Beverly Grove Park
- On the border of Bedwin Road and Camdenville Park
- On Campbell Street and Euston Road (to replace the Paperbark and Port Jackson Figs).

Submissions also stated that the over-exaggerated use of street trees was not aligned with the local character around St Peters.

Response

The urban and landscape design for the project is presented in detail in Appendix L (Urban design report) of the EIS, and includes the proposed approach to the built components and landscape plants for the project. Among other measures, the urban and landscape design for the project includes:

- Landscaping, including trees, along the western surface works area. This landscaping would include trees along and around noise barriers in this area
- Landscaping along local road upgrades, including along the border between Bedwin Road and Camdenville Park
- Landscaping along Campbell Street and Euston Road, including replacement of *Melaleuca quinquenervia* (Broad-leaved Paperbark) removed to enable upgrade works along Euston Road.

The urban and landscape design for the project would be further developed and refined during the detailed design phase of the project, in consultation with the New M5 Urban Design Review Panel, local councils along the project corridor and affected local residents. As part of that process,

consideration would be given to providing a mix of juvenile and more mature trees in landscaped areas.

More specifically, the landscaping works for the project would include:

- At the western surface works, around:
  - 1,000 mature trees (over 25 litre pot size)
  - 2,000 trees as part of massed planting areas (around 150 mm pot size)
  - Five hectares of landscaped areas
- At Arncliffe, around:
  - 50 mature trees (over 25 litre pot size)
  - 0.5 hectares of landscaped areas across Bexley and Arncliffe
- St Peters interchange and local road upgrade areas, around:
  - 1,750 mature trees (over 25 litre pot size)
  - 2,000 trees as part of massed planting areas (around 150 mm pot size)
  - 12 hectares of landscaped areas (excluding future Sydney Gateway and Stage 3 works).

The overall design intent is to create a series of tree lined local streets offering amenity for local residents, creating a high quality environment for pedestrians and cyclists, and integrate the local streetscape with adjacent open space and parkland, particularly in the vicinity of Sydney Park.

Issue description – raised garden beds

Submissions requested that raised garden beds:

- Be incorporated into the May Street footpath upgrades to reduce traffic noise, CO_2 emissions and passive heat
- Be considered to replace chicane design, comprising low maintenance, low height, water tolerant shrubs / grasses and a tree, in keeping with Marrickville Council planting policies, and the transition of storm water basin upgrades to Camdenville Park
- Furthermore, one submission provided support for the plan to use narrow raised garden beds integrated with footpaths on May Street to reduce impacts.

Response

The urban and landscape design for the project would be further developed and refined during the detailed design phase of the project, in consultation with the New M5 Urban Design Review Panel, local councils along the project corridor and affected local residents.

Opportunities to maximise the green canopy throughout the local road upgrades at St Peters with tree planting in medians where safety barriers and / or speed limits permit would be explored during detailed design, and implemented where reasonable and feasible (environmental management measure OpV10). As part of that process, consideration would be given to the design of planted areas, including the potential for raised garden beds in some areas.

Support for the plan to use narrow raised garden beds integrated with footpaths on May Street is noted.

Issue description – Sydney Park Road

Submissions objected to the destruction of Sydney Park Road.

Response

Local road upgrades to be completed as part of the project would include improvements to around 250 metres of Sydney Park Road between Mitchell Road and Euston Road. Upgrades to Sydney Park Road would also include provision of a shared use path on the southern side, adjacent to Sydney

Park, and a footpath on the northern side connecting with new and upgraded pedestrian infrastructure along Euston Road.

There is currently a pedestrian footpath on the southern side of Sydney Park Road that is of good quality. Semi mature trees currently line the street.

The proposal would continue the shared path of Euston Road on the southern side of Sydney Park Road up to the extent of works. This would complement the existing cycle route in this location and also better accommodate both pedestrian and cycle movements through increased path width. A crossing at the intersection of Sydney Park Road and Euston Road would provide a new connection for pedestrians and cyclists in this location.

The project would result in a reduction in traffic volumes, particularly heavy vehicles, travelling along Sydney Park Road, as well as improved active transport connectivity. This would improve amenity for residential receivers along the road.

Issue description – loss of natural and planted landscapes

Submissions raised concerns about the loss of natural and planted landscapes and the resulting impacts on amenity due to the location of road widenings, and at the M5 Linear Park.

Response

The project would directly affect natural and planted landscapes in the following areas:

- The majority of the western surface works associated with upgrades to the existing M5 East Motorway would be contained within the road reserve (currently zoned SP2 Infrastructure) with only minor encroachment into adjacent natural and planted landscapes. This minor loss of existing natural and planted landscapes would not affect the current use of Beverly Grove Park and the broader M5 Linear Park for recreational purposes
- Although the Kingsgrove Avenue Reserve may currently be a planted and natural landscape, the land on which the Bexley Road South motorway operations complex (MOC2) would be permanently located is zoned SP2 Infrastructure. The site is therefore intended for longer-term development for infrastructure (particularly road infrastructure) with planted and natural landscapes being accommodated as an interim use. While this interim potential for planted and natural landscapes would be lost, use of the site for road infrastructure is consistent with the well-established land use zoning outcome for the land
- Small areas of Camdenville Park (around 1.1 hectares, or about one third of the area of the park) and May Street Reserve (around 0.015 hectares, or about one fifth of the area of the reserve) would be permanently occupied by upgraded road infrastructure along Campbell Street and the intersection of Unwins Bridge Road / Campbell Street / May Street / Bedwin Road. The land affected by local road upgrades is marked for acquisition for the purpose of road infrastructure under the *Marrickville Local Environmental Plan 2011*. This loss in planted and natural landscapes is not significant in total land area, and has been designed to minimise disruption to existing recreational users, including the sporting field and support facilities in Camdenville Park. Areas not required for permanent project infrastructure would be rehabilitated and enhanced in consultation with Marrickville Council, consistent with the vision presented in the *Camdenville Park Draft Plan of Management* (Marrickville Council, March 2014)
- Strips of land along the southern and eastern boundaries of Sydney Park, totalling around 0.2 hectares or about 0.6 per cent of the total area of the park would be predominately used for the provision of pedestrian and cyclist infrastructure, to enhance connectivity in and around Sydney Park. This infrastructure would enhance, rather than detract from the public recreational values of the park
- Planted and natural landscapes along local road upgrades that would be removed as part of road widening or realignment works would be replaced with landscaped areas following completion of construction works.

Permanent impacts of the project on planted and natural landscapes would be minor, and would be further 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.

Parts of the former Alexandria landfill site not required for the St Peters interchange would also be rehabilitated and landscaped with the aim of providing these areas as additional public recreational space. This would provide a positive contribution to the total supply of open space in the local area, and given the site's proximity to Sydney Park and new pedestrian and cyclist infrastructure, would represent a significant enhancement to existing park areas.

More specifically, the landscaping works for the project would include:

- At the western surface works, around:
  - 1,000 mature trees (over 25 litre pot size)
  - 2,000 trees as part of massed planting areas (around 150 mm pot size)
  - Five hectares of landscaped areas
- At Arncliffe, around:
  - 50 mature trees (over 25 litre pot size)
  - 0.5 hectares of landscaped areas across Bexley and Arncliffe
- St Peters interchange and local road upgrade areas, around:
  - 1,750 mature trees (over 25 litre pot size)
  - 2,000 trees as part of massed planting areas (around 150 mm pot size)
  - 12 hectares of landscaped areas (excluding future Sydney Gateway and Stage 3 works).

Issue description – bare noise walls

Submissions raised concerns about advice they had received over the likelihood of hundreds of metres of noise wall remaining bare so as to make it easier for maintenance crews to inspect.

Response

One of the design intents for the project is to provide simple, uncomplicated design treatments, which would potentially use transparent and/or vertical concrete panel noise barriers. Materials for noise barriers are selected with consideration to providing a visually acceptable, low maintenance outcome. However, this does not mean 'bare' noise walls, and can include colours, patterns and textures. Section 6.5 of Appendix L (Urban design report) of the EIS identifies the design intent for noise barriers proposed at the western surface works.

The final form, materials used and treatments of noise barriers for this project would be determined in consultation with the affected local residents, and would be included in the final urban design and landscape plan for the project.

Further information of Roads and Maritime's *Noise wall design guideline – Design guidelines to improve the appearance of noise walls in NSW* (RTA, 2006) can be found at http://www.rms.nsw.gov.au/documents/projects/planning-principles/urban-design/noise-wall-design-guideline.pdf.

Issue description – stormwater basin design

Submissions suggested that the proposed stormwater basin design be replaced with the Marrickville Council stormwater basin design, which comprises an increased basin depth, strategically placed fencing and landscaping (vegetation and trees) to create a useable space for the community.

Response

Roads and Maritime is aware of Marrickville Council's masterplan for Camdenville Park and the desired outcome for the current stormwater detention basin. The project would require works in this area to manage the increase in flows within the catchment draining to the park for events up to and including the 100 year ARI flood. The final drainage strategy, including the nature of any required

works to the basin, would be determined during detailed design and in consultation with Marrickville Council.

Issue description – property specific adjacent designs

A submission from a resident in St Peters requested further information about urban design and layout adjacent to their property.

Response

Given that the aforementioned St Peters resident chose to remain anonymous, specific details regarding construction layout and detailed operational design could not be provided for this response.

Interested parties are advised to refer to Figure 6-4 in the EIS (Chapter 6 – Construction work) for indicative construction works in the St Peters area. For indicative operational layouts in the St Peters area, interested parties are advised to refer to Figure 5-8, Figure 5-25, Figure 5-26, Figure 5-27, Figure 5-28 and Figure 5-41 in the EIS (Chapter 5 – Project description).

Issue description – support for the project

A submission provided full support for the project, including the urban amenity it would provide.

Response

Support for the project, including the urban amenity it would provide, is noted.

Issue description – scale and materials

Submissions raised concerns about the visual impacts of the project's scale and chosen materials, including the following:

- Unattractive man-made environment
- Little or no natural vegetation restored
- Monumental scale which is not people-friendly
- Traffic visible to residents
- Earth mound not replaced
- Little or no vegetation to reduce maintenance along the M5
- Highly visible to residents.

Response

A material palette has been developed for utilisation in built-form structures throughout the project. Materials were selected for appearance, durability and maintainability, with the main focus on materials and finishes that would visually unify buildings across the project. Examples of these materials proposed to be incorporated throughout the project are included in Section 5.1 of the Urban design report (Appendix L of the EIS).

Maintenance facilities and motorway control centres would be designed to be used and inhabited by people on a daily basis. These structures would provide spaces and volumes appropriate to human scale, contain materials with a tactile quality, and create environments that are both comfortable and sustainable for their occupying personnel and surrounding environments.

Buildings and facilities supporting the operation of the tunnels and portals would be refined and elegant sculptural objects designed to integrate into their adjacent environments.

The WestConnex Urban Design Framework provides specific urban design direction for the development and delivery of WestConnex in the form of design objectives as further detailed in Chapter 14 (Visual impacts and urban design). An Urban Design Review Panel has been formed to oversee development of urban and landscape design for the project. The Panel makes recommendations in relation to architecture, urban and landscape design and artistic aspects of the project.

A final Urban Design and Landscape Plan would be prepared in consultation with the New M5 Urban Design Review Panel, local councils within the project corridor and the local community as detailed in Chapter 30 of the EIS (Summary of environmental management measures). The Plan would include (but not be limited to):

- The architectural treatment of the ventilation facilities, which would be informed by the functional requirements and the design principles detailed in the New M5 Urban Design Report.
- Landscape plans and final plant species for the western surface works, Bexley Road motorway operations complex, Arncliffe motorway operations complex, the St Peters interchange and local road upgrades
- The artwork strategy for the Kindilan underpass (refer to **Section 5.13.7** of this report)
- Consideration of the outcomes of the Safety in Design review of the project (environmental management measure OpVO6).

As detailed in Chapter 30 of the EIS (Summary of environmental management measures), the removal of established vegetation would be minimised, where possible (environmental management measure BO2). Revegetation and landscaping is also planned to be undertaken to minimise lighting and other visual impacts from construction compounds (as opposed to impacts from diverted shared paths and along residential property lines), and would be required to be undertaken progressively (environmental management measure VO3) with the use of fast growing species (as opposed to mature trees) where reasonable and feasible (environmental management measure VO2). Existing vegetation around the perimeter of the construction compounds would be retained where feasible and reasonable (environmental management measure V01).

- The landscape character impact assessment detailed in Chapter 14 (Visual impacts and urban design) found that the operation of the project would result in impacts ranging from low to moderate for residential areas within the project corridor. The operational visual impact assessment found that the operation of the project would only result in high-to-moderate visual impacts for:
- Residents at the intersection of Flora Street and Marsh Street as a result of the operation of the Arncliffe surface works, including the Arncliffe motorway operations complex (MOC3)
- Residents along Campbell Street between Unwins Bridge Road and Princes Highway as a result of the operation of the planned local road upgrades,

And only high visual impacts for:

- Residents along Campbell Road and Barwon Park Road as a result of the operation of the St Peters interchange
- Residents along Campbell Road between Barwon Park Road and Burrows Road as a result of the operation of the planned local road upgrades.

As part of the western surface works taking place near to the Kingsgrove South construction compound (C2), existing noise mounds / barriers in the Beverly Grove Park North would be removed. However the design of the noise attenuation at the western surface works Kingsgrove area would be confirmed during detailed design and in consultation with the local community as detailed in Chapter 30 of the EIS (Summary of environmental management measures). This may consist of noise mounds and barriers (or a combination of both) and with consideration to the provision of accessible open space at Beverly Grove Park and a landscaped outlook (environmental management measure OpV07).

Issue description – space under flyover

Submissions raised the concern that, while there would be allocated space under the flyover, it would not be used due to noise, pollution and shading.

Response

Significant new areas of open space would be created around the St Peters interchange as a result of the project as detailed in Chapter 14 in the EIS (Visual impacts and urban design). During detailed design, the final urban design and landscape plan would be finalised in consultation with the New M5 Design Panel, local councils and the community.

The areas under bridges within the interchange would be integrated within the overall design outcome of the open spaces within the interchange site. This would include targeted treatments of the spaces under the road bridges that reflect the micro-environment conditions.

5.13.6 Operational light spill

60 submitters raised issues regarding light spill during operation.

Issue description – impacts to amenity changing the urban environment

Submissions raised concerns about how light spill would alter the amenity of the urban environment.

Response

Operational lighting installed as part of the project would be the minimum required to ensure safe operations. The lighting would be designed and installed to minimise the extent of light spill outside the project footprint, and to maintain existing amenity where feasible and reasonable (environmental management measure OpV12).

The visual impact assessment presented in Chapter 14 (Visual impacts and urban design) of the EIS concludes that lighting impacts would vary from negligible to moderate for most receivers, with the exception of:

- Pedestrians and cyclists using Beverly Grove Park and the M5 Linear Park at night would experience moderate to high lighting impacts. The transient nature of these receivers, and the lower likelihood of using park areas at night, would mitigate some of this potential lighting impact
- Residential receivers along Campbell Road would experience a high lighting impact at night due to the significant change in the nature and capacity of Campbell Road as part of the project
- Residential receivers along Barwon Park Road, near the intersection of Campbell Road, would experience a moderate to high lighting impact at night due to the significant change in the nature and capacity of Campbell Road and the intersection with Barwon Park Road as part of the project

Further consideration of opportunities to minimise lighting impacts on adjacent receivers, particularly those along Campbell Road and Barwon Park Road, would be investigated during the detailed design phase. This would include consideration of measures such as the use of cut-off and directed lighting to minimise light spill and glare.

Issue description – light pollution impacting residents

Submissions raised concerns about how light pollution would affect residents and residential areas.

Response

Most residential receivers would experience a negligible to a moderate lighting impact as a result of the project, as summarised in Table 14-16 (Visual impacts and urban design) of the EIS. The two key exceptions would be:

- Residential receivers along Campbell Road, who would experience a high lighting impact at night due to the significant change in the nature and capacity of Campbell Road as part of the project
- Residential receivers along Barwon Park Road, near the intersection of Campbell Road, who would experience a moderate to high lighting impact at night due to the significant change in the nature and capacity of Campbell Road and the intersection with Barwon Park Road as part of the project.

Further opportunities to minimise lighting impacts on adjacent receivers, particularly those along Campbell Road and Barwon Park Road, would be investigated during the detailed design phase. This would include consideration of measures such as the use of cut-off and directed lighting to minimise light spill and glare (environmental management measure OpV12).

Issue description – street lights and traffic lights

Submissions raised concerns about the impacts of street lights and traffic lights would impact on security, light pollution and antisocial behaviour.

Response

Lighting, including street lighting, is a recognised means of improving the capacity for natural surveillance which in turn can be effective in minimising the risk of crime and antisocial behaviour, and improving security. Street lighting installed as part of the project would therefore maintain or improve security levels in affected areas.

Operational lighting installed as part of the project would be the minimum required to ensure safe operations. The lighting would be designed and installed to minimise the extent of light pollution and light spill outside the project footprint, and to maintain existing amenity where feasible and reasonable (environmental management measure OpV12).

Issue description – St Peters Street and Campbell Road car park

Submissions raised concerns that the location of the St Peters and Campbell Road car park would cause increased night lighting.

Response

An off street car park is planned for the intersection of Campbell Street and St Peters Street during the operation of the project. Cut-off, directed lighting and landscaping would be used to minimise light spill and glare (environmental management measure OpV12). The use of shade trees would be considered as part of car park designs where reasonable and feasible to soften views and provide shade and visual amenity, and to minimise lighting impacts (environmental management measure OpV03).

5.13.7 Safety and crime prevention

Seven submitters raised issues regarding crime prevention measures and public safety in project design

Issue description – pedestrian and shared pathway access and security

Submissions raised concerns regarding access and security issues resulting from the use of pedestrian and shared pathways, including potential for overlooking into rear yards.

Response

The design of pedestrian and shared pathways would be developed further during detailed design. As part of that process, the guidance provided by the Safer By Design program managed by the NSW Police Force and *Crime Prevention and the Assessment of Development Applications* (DUAP, 2001) would be taken into account. The design of all publicly-accessible elements of the project would consider the four principles of Crime Prevention Through Environmental Design (CPTED):

- Surveillance, being natural, technical or mechanical surveillance
- Access control, for example, through the use of landforms, built form, formal and informal pathways, landscaping, fencing
- Territorial reinforcement, meaning the use of actual and symbolic boundary markers, spatial legibility and environmental cues to encourage community ownership of a public space
- Space management, meaning the supervision and maintenance of a space.

Issue description – appropriate location of park facilities

Submissions raised concerns regarding the appropriate location of park facilities, and the potential for public safety and security issues, as well as park facilities such as barbecues and playgrounds to minimise insurance claims.

Response

All publicly-accessible elements of the project would be designed and implemented with the aim of ensuring safety and security. Design of park facilities would take into account the guidance provided by the Safer By Design program managed by the NSW Police Force and *Crime Prevention and the Assessment of Development Applications* (DUAP, 2001), and the four principles of Crime Prevention Through Environmental Design (CPTED):

- Surveillance, being natural, technical or mechanical surveillance
- Access control, for example, through the use of landforms, built form, formal and informal pathways, landscaping, fencing
- Territorial reinforcement, meaning the use of actual and symbolic boundary markers, spatial legibility and environmental cues to encourage community ownership of a public space
- Space management, meaning the supervision and maintenance of a space.

The design guidelines *Designing to Minimise Vandalism* (Final Draft) (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.

Issue description – St Peters Street and Campbell Road car park

Submissions raised concerns that the location of the St Peters Street and Campbell Road car park would encourage anti-social behaviour.

Response

All publicly-accessible elements of the project would be designed and implemented with the aim of ensuring safety and security. The design of the car park would take into account the guidance provided by the Safer By Design program managed by the NSW Police Force and *Crime Prevention and the Assessment of Development Applications* (DUAP, 2001), and the four principles of Crime Prevention Through Environmental Design (CPTED):

- Surveillance, being natural, technical or mechanical surveillance
- Access control, for example, through the use of landforms, built form, formal and informal pathways, landscaping, fencing
- Territorial reinforcement, meaning the use of actual and symbolic boundary markers, spatial legibility and environmental cues to encourage community ownership of a public space
- Space management, meaning the supervision and maintenance of a space.

The design guideline *Designing to Minimise Vandalism* (Final Draft) (Roads and Traffic Authority, 2008a) would also be taken into account.

The final configuration and use of the St Peters Street and Campbell Road car park would also be determined in consultation with the St Peters public school.

Issue description – Kindilan underpass

Submissions raised concerns that the extension of the Kindilan underpass from a length of 26 metres to 77 metres would impact users. Submissions raised concerns over safety, due to the extended length of the underpass.

Response

The extension of the Kindilan underpass from 26 metres to 77 metres would be done within Beverly Grove Park to accommodate the project. Details are provided in Section 5.4.1 of the EIS.

Potential safety impacts from the extension of the Kindilan underpass would be managed through appropriate lighting. The motorway above the underpass would feature separated carriageways that would allow light to permeate through the main shafts into the underpass (refer to Section 7.2 of Appendix L: Urban design report in the EIS). Lighting would also be provided during the night to accommodate for the extension.

Issue description – access equality

Submissions raised concerns that the project (particularly around the St Peters interchange) does not allow for a comparable level of access for less mobile pedestrians, particularly on widened roads, stating the project encourages high speed car travel and fails the Disability Discrimination Act 2009 (Cth).

Response

The new works would be designed in accordance with relevant Australian Standards, Austroads Design Standards, Guides and Codes, and the Roads and Maritime supplements to these documents. This would ensure that works are designed in a safe and operable manner and with reference to the *Disability Discrimination Act 2009* (Cth).

When complete, the upgrades to local roads around the St Peters interchange would create substantial new capacity along Campbell Street and Euston Road and direct through traffic along these routes and away from residential properties along other suburban streets in the area.

The diverting of through traffic from local roads onto these upgraded roads around the St Peters interchange, as well as onto the WestConnex tunnels, would be instrumental in improving pedestrian access (including less mobile pedestrians) and cyclist safety.

5.14 Social and Economic

5.14.1 General social and community impacts

3,828 submitters raised issues regarding social and community impacts resulting from the project.

Issue description – general concerns around social and community impacts

Submissions raised concerns that the project would result in general social and community impacts including impacts on culture, local character, liveability, quality of life and lifestyle. Areas mentioned in submissions include: Sydney, the inner west, Newtown, St Peters, Erskineville, Alexandria, Rosebery, Sydney Park, King Street, Euston Road, Redfern, Ashfield, Tempe and Enmore.

Response

It is acknowledged that due to its size and complexity, construction and operation of the project would involve management of many different environmental issues, including social and community impacts such as impacts on culture, local character, liveability, quality of life and lifestyle. The environmental issues associated with impacts on culture, local character, liveability, quality of life and lifestyle are identified and assessed within the relevant sections of the EIS, including traffic and transport (Section 9.3.1) air quality (Section 10.6), noise and vibration (Section 12.4.1), land use and property impacts (Section 13.3.1) and visual impacts (Section 14.3.1). The EIS assessed the potential for the project to create social and community impacts and concluded that impacts can be avoided, mitigated or offset by the benefits of the project, as summarised below.

Construction impacts would be mainly contained to St Peters, including around Sydney Park and Euston Road, and Alexandria. Areas further afield such as Sydney, the inner west, Erskineville, Rosebery and King Street are unlikely to be significantly impacted during construction of the project. The EIS demonstrates that the impacts of construction on traffic, air quality, noise and vibration, and visual amenity would be temporary and can be managed with the implementation of environmental management measures (refer to **Chapter 8** of this document for revised environmental management measures).

Impacts of construction on land use and property include acquiring or temporarily occupying land for construction. In order to facilitate construction activities, the construction footprint of the project would be larger than the operational footprint. This means that once the project is operational, land not

required for construction would be rehabilitated and made available for redevelopment or open space as described in Section 13.3.1 of the EIS. The EIS concluded that the project would provide much needed additional open space for the growing population around St Peters (refer to Section 14.3.2, page 14-74 of the EIS).

Operation of the project would potentially impact on local communities at the eastern end of the project as a result of changes to traffic volumes, and the introduction of operational infrastructure to the local area. Operational impacts in these areas are identified and assessed in the relevant sections of the EIS as described above. The EIS demonstrates that these impacts can be managed within acceptable limits with the implementation of environmental management measures (refer to **Chapter 8** of this report for the revised environmental management measures).

The introduction of new project infrastructure in St Peters would result in a number of benefits on local character and liveability. The project would provide new public open space through conversion of the former landfill site in Alexandria into both transport infrastructure and parkland, significantly increasing vegetation coverage with new passive recreation areas for the local community.

The project would also enhance active transport connectivity around St Peters through the inclusion of new and upgraded pedestrian and bicycle infrastructure. The project would deliver around 14 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.

During the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. Following exhibition of the EIS and in response to submissions, additional work has been undertaken to build on the work completed to date, and to ensure pedestrian and cyclist facilities are consistent with existing State and local government policies and strategies.

New active transport infrastructure in the St Peters, Mascot and Alexandria precincts would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure.

Issue description – community isolation / segmentation

Submissions raised concerns that the project would result in isolation and segmentation of communities.

Response

The project has been designed to limit the potential for isolation and segmentation of communities (community severance) by adopting a tunnel option for the new motorway, which runs underground for most of the length of the project (refer to Section 4.3.3 of the EIS). As a result, the project design minimises the requirement for surface land acquisition and consequential impacts on connectivity within local communities along the project alignment.

Further, at the western end of the project area, the New M5 motorway tunnels would connect to the existing M5 East Motorway, which already bisects the landscape. Existing north-south connectivity would be maintained during operation of the project and consequently the project would not decrease north-south connectivity between communities at this location.

At the eastern end of the New M5 tunnel, local road upgrades and widenings would have relatively minor impacts on pedestrian and cycling connectivity and would not lead to community severance.

The project would also include new and upgraded pedestrian and bicycle infrastructure, which has been designed and located with enhanced connectivity, as well as safety, as high priorities. New infrastructure would maintain and enhance pedestrian and cyclist accessibility and connectivity, particularly around the St Peters interchange and Sydney Park. Upgrades to existing pedestrian and bicycle infrastructure would provide a safe cyclist and pedestrian environment by minimising the interfaces with vehicular traffic, and would also provide a regional cycle path connection between Mascot and Marrickville.

The project would improve connectivity between communities by reducing congestion and delivering travel time savings along the M5 Motorway corridor. By reducing congestion, the project would enhance connectivity and active movement across major transport corridors for local communities. Reducing congestion and improving travel times would also help to connect residential communities in south-west Sydney with locations of employment in the east. The EIS (refer to Section 15.3.2) concluded that it is anticipated to have a positive impact on the sense of connectedness and cohesion within the wider community.

Issue description – level and quality of the social impact assessment

Submissions raised concerns about the level and quality of the social impact assessment stating that it ignores evidence of negative impacts on community identity and social connections. Specific concerns include:

- The impacts are based on outdated data (2011)
- The assessment does not define 'hard' vs 'soft' infrastructure and the associated impacts to the community
- The assessment does not include a cumulative assessment of direct, indirect, and cumulative social and economic impacts of the project
- The assessment underestimates the psychological and social impact of the project on the community of St Peters
- Potential impacts on St Peters Public School including closure have not been considered
- Specific suburbs weren't addressed in the assessment including
  - Tempe
  - St Peters
  - Alexandria
  - Erskineville
  - Newtown
  - Enmore
  - Stanmore
- The social benefits of WestConnex are not supported by evidence
- Concern that no meaningful management measures are proposed for the social impacts of the project
- The EIS did not assess social impacts to the removal of Beverly Grove Park

Response

The social impact assessment presented in Appendix M (Technical working paper: Social and economic) of the EIS has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs), and the relevant provisions of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* The social impact assessment includes a balanced assessment of both the potential positive and negative impacts on community identity and social connections.

The social impact assessment was undertaken in accordance with the *Environmental Impact Assessment Practice Note: Socio-economic assessment* (Roads and Maritime, 2013b). The practice note provides a framework for assessing socio-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. A detailed description of the methodology used in the assessment of social impacts is provided in Section 2 of the Technical working paper: Social and economic (Appendix M of the EIS), which also provides a discussion of the

social and economic impacts and benefits of the project. Management measures are discussed in Section 7 of the Technical working paper: Social and economic (Appendix M of the EIS).

The study area for the social and economic impact assessment has been identified as the geographical statistical areas (as defined by the Australian Bureau of Statistics (ABS) (Australian Bureau of Statistics, 2011)) that encompass the project, as well as the wider catchment as it relates to the use of the New M5 Motorway.

The construction impacts to recreational and community facilities, including Beverly Grove Park are discussed in Section 5.1.3 in the Technical working paper: Social and economic (Appendix M of the EIS) and operational impacts are discussed in Section 6.1.2. The Kingsgrove North construction compound (C1) would be partly located within the existing M5 East Motorway corridor, and partly on land currently zoned and used for public recreation and light industrial development. The use of Beverly Grove Park North would be temporarily restricted during construction and would be rehabilitated and returned for public recreation at the end of construction.

Landscaping plans for the area to be rehabilitated and returned for public recreation would be developed during detailed design in order to minimise visual impacts and improve the amenity of the future open space area. These plans would be developed in consultation with Canterbury City Council to ensure they integrate appropriately with the design of Council's open space area.

Further discussion on the impacts to open space is discussed in **Sections 5.14.6** and **5.14.7** of this report.

The profile of the existing social and economic environment of the study area (Section 3.0 of the Technical working paper: Social and economic in Appendix M in the EIS) was informed by the most recent release of the Australian Census of Housing and Population (Australian Bureau of Statistics, 2012), unless otherwise stated. Other information sources included the most recently available data from other Australian Bureau of Statistics reports (prepared between 2011 and 2014) and the Department of Planning and Environment (DPE) *Population, Household and Dwelling Projections* (2014). The EIS acknowledges that as this census was undertaken in 2011, there may be some minor discrepancies in the representation of the current characteristics of the local, regional and state economies.

As described in Chapter 14 of the EIS (Visual impact and urban design), hard infrastructure elements refer to built infrastructure, while soft elements refer to proposed landscaping features. Potential impacts relating to hard and soft infrastructure are described in Chapter 14 and the Technical working paper: Landscape character and visual impact (Appendix K) of the EIS.

It is acknowledged that road traffic noise (including in the St Peters area) may have possible effects on mental health (usually in the form of exacerbation of existing issues for vulnerable populations rather than direct effects). Annoyance can be a major consideration because it reflects the community's dislike of noise and their concerns about the full range of potential negative effects. Management measures have been considered to reduce noise levels in those locations where it would be above applicable traffic noise guideline values (refer to **Chapter 8** (Revised environmental management measures) of this report).

During construction, the Roads and Maritime would continue to work with the community to ensure they are informed about the project and have opportunities to provide feedback to the project team. The Draft Community Consultation Framework in Appendix E of the EIS provides information on the key consultation activities and processes that would be undertaken during construction.

Some temporary disruption for access to St Peters Public School may be experienced during construction as road works would be undertaken along Campbell Street and St Peters Street, however these impacts would be temporary for the duration of the works and access to the school (and residences) would be maintained.

During operation, one school building at St Peters Public School and the St Peters Community Pre-school (which is classified as a childcare centre under the NSW Road Noise Policy) are eligible for consideration of additional noise mitigation during the daytime only.

The St Peters community pre-school is eligible for consideration for both external and internal areas of the property. Nearby areas of Sydney Park and the majority of Simpson Park (active recreation

areas) would be exposed to road traffic noise levels which also exceed the applicable noise assessment criteria. Road traffic noise levels at all other childcare centres, commercial properties and places of worship are predicted to comply with the criteria.

The eligibility of St Peters Public School and St Peters Community Pre-school for noise mitigation would be confirmed during detailed design and based on measured noise measurements specific to these locations.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken to meet the project noise requirements.

The project would improve pedestrian and cyclist access to St Peters Public School through the provision of new cycling lanes and wider footpaths along Campbell Street as well as new signalised intersection.

The project would not impact on the ongoing operability of the St Peters Public School.

Issue description – impacts on all community facilities not assessed

Submissions raised concerns that the social and economic impact assessment did not assess all community facilities which may be impacted. In particular submissions raised the following:

- The social and economic impact assessment did not meet the SEARs as community facilities within the vicinity of the St Peters interchange, including the Erskineville Town Hall and St Mary's Church were not assessed
- The assessment did not consider all schools and childcare centres along the identified project route. Omitted schools include:
  - Our Lady of Fatima Primary on Caroline Street at Kingsgrove
  - Bexley North Primary
  - Kingsgrove Primary, Caroline / Stoney Creek Road (impacted also by higher traffic on Stoney Creek Road)
  - Kingsgrove High, Kingsgrove Road / Stoney Creek Road (impacted also by higher traffic on Stoney Creek Road)
  - Babies Oasis (Day Care centre) Kingsgrove Avenue
  - St Pius at St Peters
  - St Peters Community Preschool
  - OOSH St Peters
  - St Peters Playgroup
  - Erskineville Primary
  - Haberfield Public School.

Response

The social and economic assessment in Chapter 15 and Appendix M (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 identified as being within the study area is provided in Appendix B of the Technical working paper: Social and economic (Appendix M of the EIS). This list includes educational facilities, sporting facilities, places of worship, community halls and libraries.

The study area for the social and economic impact assessment aligns with the geographical statistical areas (as defined by the Australian Bureau of Statistics (ABS) (Australian Bureau of Statistics, 2011))

that encompass the project, as well as the wider catchment as it relates to the New M5. Community facilities within the study area were assessed for potential impacts from the project including potential impacts to access and amenity, as well as impacts to community identity and social cohesion.

As facilities such as the Erskineville Town Hall and St Mary's Church would not be directly impacted by the project and are not anticipated to experience indirect impacts (eg traffic, air quality, noise) due to their distance from the project area, they have not been included in the assessment.

Educational facilities located within the immediate vicinity of project works were detailed in Table 15-2 of the EIS and their locations were mapped on Figure 15-2 to Figure 15-5 of the EIS. Table 15-2 identifies those facilities which were deemed as being within the immediate vicinity of the project and therefore required further assessment. Facilities which lie outside of the immediate project area are considered to be outside of the area of significant impact and therefore are not included in the social and economic assessment.

It is noted that the St Peters Community Pre-school and the Tribe OOSH (St Peters) form a part of the St Peters Public School. The St Peters Community Pre-school has frontage at 18 St Peters Street at St Peters and Church Street). The Tribe OOSH offers out of school hours (OOSH) services and is located within the St Peters Public School.

Issue description – increased security risks

Submissions raised concerns that location of construction compounds near residential properties would increase the risk of theft at adjacent residential properties. Concerns also included the potential for the project to cause an absence of people in affected areas which would then attract unsavoury people (drug users) to the area.

Response

Lighting, including street lighting, is a recognised means of improving the capacity for natural surveillance which in turn can be effective in minimising the risk of crime and antisocial behaviour, and improving security. All publicly-accessible parts of the project would be designed and implemented with the aim of ensuring safety and security.

Design of publicly-accessible parts of the project would take into account the guidance provided by the Safer By Design program managed by the NSW Police Force and Crime Prevention and the Assessment of Development Applications (DUAP, 2001), and the four principles of Crime Prevention Through Environmental Design (CPTED), being:

- Surveillance
- Access control
- Territorial reinforcement
- Space management.

The design guidelines Designing to Minimise Vandalism (Final Draft) (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.

Establishment of construction compounds would include establishment of security measures. It is assumed that construction and operational light levels would be sufficient to meet occupational health and safety levels, and security levels.

Issue description – employment of locals and Indigenous people

Submissions raised questions as to whether Indigenous people and businesses are being employed as part of this project.

Response

Construction of the project would require the employment of a skilled construction workforce, comprising trades and construction personnel, subcontract construction personnel and engineering, functional and administrative staff.

The investment in Sydney's road network would create almost 10,000 jobs during the construction phase. Specifically, the project is expected to support around 1,550 construction jobs as well as numerous operational jobs. A peak construction workforce of up to 1,400 staff is expected during the construction phase of the project. This provides employment opportunities and would support businesses that service the project and the construction workforce.

As outlined in Table 28-3 of Chapter 28 (Sustainability) in the EIS, the WestConnex Sustainability Strategy has set a target for the project to employ the equivalent of 155 apprentices / trainees during design and construction, and to maximise employment and training opportunities for young people, Aboriginal and Torres Strait Islanders, disadvantaged groups, long term unemployed and people who live in western Sydney and along the project alignment.

Issue description – positive community impacts from construction

Submissions raised concerns over what the positive impacts of construction would be to communities. In particular the following was raised; Appendix G (Traffic and Transport), Section 7.1.4 (Community difficulties in the vicinity of construction activities) of the EIS states there is the potential for positive impacts on 'residents, businesses, road users (including commercial and freight vehicles), users of community facilities and the wider community,' what would the positive impacts be? These are not outlined and difficult to imagine, especially as they relate to traffic and transport.

Response

Section 15.3.1, of Appendix M (Social and Economic) of the EIS, discusses the potential social and economic impacts from construction. This section also provide information on positive impacts such as indirect and direct economic benefits, benefits to business providing services for the project and benefits to local businesses such as cafes and food vendors.

5.14.2 Construction amenity and traffic

337 submitters raised issues regarding amenity in the vicinity of the project during construction.

Issue description – impacts on amenity from construction activities

Submissions raised concerns that construction works would affect amenity for residents due to traffic, heavy truck movements, dust, noise and vibration.

Response

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 recommended to minimise impacts to within acceptable limits.

Construction related amenity impacts are discussed in some detail in the following sections of the EIS:

- Traffic impacts - Chapter 9 and Appendix G (Technical working paper: Traffic and transport) of the EIS
- Air quality impacts – Chapter 10 and Appendix H (Technical working paper: Air quality) of the EIS
- Noise and vibration impacts – Chapter 12 and Appendix J (Technical working paper: Noise and vibration) of the EIS
- Human health impacts – Chapter 11 and Appendix I (Technical working paper: Human health risk) of the EIS
- Visual impacts and urban design – Chapter 14, Appendix K (Technical working paper: Landscape character and visual impact) and Appendix L (Urban design report) of the EIS.

5.14.3 Operational amenity and traffic

1,672 submitters raised issues regarding amenity in the vicinity of the project during operation

Issue description – traffic and amenity impacts in the vicinity of the St Peters interchange

Submissions raised concerns around the impact of the project on local amenity in the vicinity of the St Peters interchange resulting in dangerous and unfriendly environments with impacts on liveability and cultural vibrancy. Concerns were raised regarding potential amenity impacts at the following specific locations:

- King Street in Newtown
- Euston Road in Alexandria
- Offices along Gardeners Road
- Local schools
- Campbell Street, Unwin's Bridge Road, May Street, and Maddox Street
- Northbound left turn lane from Euston Road in Alexandria into Maddox Street
- The proposed car park at the junction of St Peters Street and Campbell Road
- The properties adjacent to Euston Road (north of Sydney Park Road).

Response

Increased road traffic has the potential to impact on amenity through increased traffic volumes, increased noise and vibration, and reduced air quality resulting from vehicle emissions.

Traffic modelling indicates that King Street is expected to experience reduced peak hour volumes under the 2021 'with project' scenario and 2031 cumulative scenario when compared to the 'without project' scenario. As there would not be any significant changes to traffic volumes and no modifications to King Street proposed as part of this project, the project is not anticipated to have a significant impact on amenity along King Street.

During operation of the project, traffic volumes would increase around the St Peters interchange along upgraded local roads including Campbell Road and Euston Road. This would be attributable to additional traffic using the St Peters interchange as well as an increase in traffic generated by local trips. The increase in traffic volumes could result in increased noise levels for some receivers (including residents) located adjacent to Campbell Street / Campbell Road and Euston Road. Section 9.4.2 and the Technical working paper: Noise and vibration (Appendix J) of the EIS identifies these affected receivers.

A total of 133 day time receiver locations and 145 night time receiver locations have been identified as likely to experience road traffic noise above applicable assessment criteria in 2031 with the implementation of the project. These receiver locations are mainly located around the St Peters interchange, including on Euston Road.

In addition, one school building at St Peters Public School and the St Peters Community Pre-school (which is classified as a childcare centre under the NSW Road Noise Policy) are eligible for consideration of additional noise mitigation during the daytime only.

The St Peters community pre-school is eligible for consideration for both external and internal areas of the property. Nearby areas of Sydney Park and the majority of Simpson Park (active recreation areas) would be exposed to road traffic noise levels which also exceed the applicable noise assessment criteria. Road traffic noise levels at all other childcare centres, commercial properties and places of worship are predicted to comply with the criteria.

The eligibility of St Peters Public School and St Peters Community Pre-school for noise mitigation would be confirmed during detailed design and based on measured noise measurements specific to these locations.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken to meet the project noise requirements.

None of the receivers identified as affected by noise from the project are located on King Street in Newtown.

Consistent with the *Road Noise Policy* (EPA, 2011), all feasible and reasonable management measures must be considered to reduce the extent to which road traffic noise exceeds applicable assessment criteria at these 145 receiver locations and two school buildings. The identification and evaluation of feasible and reasonable management measures for these locations is included in Section 12.5.2 of the EIS and includes a combination of at-source treatments (such as low noise pavement selection), noise barriers and potential at-property acoustic treatments. These management measures would be confirmed during detailed design of the project, including confirmation of receiver locations that would be eligible for consideration of at-property acoustic treatments.

In relation to air quality, the project is expected to result in lower total pollutant levels across the project corridor. Specifically, the project is anticipated to redistribute the impacts associated with emissions derived from vehicles using surface roads. For much of the community this would result in no change or a small improvement (i.e. reduced concentrations and fewer health impacts). However, for some areas located near key surface roads a small increase in pollutant concentrations may occur. Potential health risks associated with changes in air quality (specifically nitrogen dioxide and particulate matter) within the local community have been assessed in the EIS and are within acceptable limits.

Issue description – reduced connectivity between social infrastructure and community facilities

Submissions raised concerns that the project would reduce the ability to move around the local area and negatively impact on access and connectivity between social infrastructure and community facilities.

Response

The project would increase accessibility to community facilities through the introduction of new road, public transport and pedestrian / cycle infrastructure.

The project has been designed to limit impacts on access and connectivity within local communities by adopting a tunnel option for the new motorway, which would run underground for most of the length of the project (refer to Section 4.3.3 of the EIS). As a result, the project design minimises impacts on connectivity to social infrastructure and community facilities within local communities along the project alignment.

Further, the project would facilitate improved access and connectivity by reducing congestion and delivering travel time savings. By reducing congestion, the project would enhance connectivity between communities across major transport corridors. Reducing congestion and improving travel times would also contribute to improved connectivity between social infrastructure and community facilities.

The local road upgrades to be carried out as part of the project would include new and upgraded pedestrian and bicycle infrastructure, which has been designed and located to enhance connectivity. This infrastructure would maintain and enhance pedestrian and cyclist accessibility and connectivity, particularly around the St Peters interchange and Sydney Park. The upgrades to pedestrian and bicycle infrastructure would provide for a safe cyclist and pedestrian environment by minimising the interface of cyclists and pedestrians with vehicular traffic, and would also provide a regional bicycle connection between Mascot and Marrickville. There would also be improved connections from Campbell Road to Simpson Park and Camdenville Park at St Peters with new separated pedestrian / cycle paths.

Issue description – impacts on local amenity in areas at the western end of the project

Submissions raised general concerns that operation of the project would result in amenity impacts in areas surrounding the western end of the project including Moorefields Road at Kingsgrove.

Response

It is acknowledged that due to its size and complexity, construction and operation of the project would involve management of many different environmental issues, including impacts on general amenity.

Amenity impacts during construction include factors that affect the ability of a resident, visitor or business owner to enjoy their home, business and / or daily activities.

The EIS assessed the potential for the project to create social and community impacts and concluded that impacts can be avoided, mitigated or offset by the benefits of the project, as summarised below for both construction and operation.

Construction

Construction of the western surface works would involve construction traffic movements along Moorefields Road at Kingsgrove to allow access to Kingsgrove North (C1) and Kingsgrove South (C2) construction compounds. The roads used to travel to the principal construction compound access point would be Kingsgrove Road, Moorefields Avenue, Wirega Avenue and Garema Circuit (refer to Figure 9-10 of the EIS). These roads are located adjacent to a mixture of mostly industrial and residential land uses.

Construction traffic would be unlikely to contribute substantially to congestion impacts along Moorefields Road (and the broader area around the western surface works) although average delays at some intersections would increase slightly during the peak periods. This is mainly due to the small volume of total construction traffic relative to expected background traffic volumes in 2016 (refer to Section 9.3.1 of the EIS and **Section 5.8.3** of this report for further details regarding construction traffic impacts along Moorefields Road).

The Construction Traffic Management and Safety Plan would include the guidelines, general requirements and principles of traffic management to be implemented during construction, including specific provisions to manage potential impacts of construction traffic on local roads around the construction compounds.

The EIS demonstrates that the impacts of construction on traffic, air quality, noise and vibration, and visual amenity would be temporary and can be managed with the implementation of environmental management measures (refer to **Chapter 8** of this report for revised environmental management measures). The environmental issues associated with general amenity are identified and assessed within the relevant sections of the EIS, including traffic and transport (Section 9.3.1) air quality (Section 10.6), noise and vibration (Section 12.4.1), land use and property impacts (Section 13.3.1) and visual impacts (Section 14.3.1).

To manage the impacts of construction traffic on local residents and businesses, a community involvement plan would be implemented to provide timely, regular and transparent information about changes to access and traffic conditions, details of future work programs and general construction progress throughout the construction phase of the project. Information would be provided in a variety of ways including letter box drops, media releases, internet site, signage and a hotline (as per environmental management measure SEO1 in **Chapter 8** (Revised environmental management measured) of this document).

The EIS found that impacts of construction on air quality can be managed through the use of effective mitigation. Further, it was found that impacts would be temporary and relatively short-lived (refer to Section 10.6.1 of the EIS).

Operation

Operation of the project would potentially impact on local communities at the western end of the project as a result of changes to traffic volumes, as well as the introduction of operational infrastructure to the local area. The EIS demonstrates that these operational impacts at the western end of the project could be managed within acceptable limits with the implementation of environmental management measures (refer to **Chapter 8** (Revised environmental management measures) of this report). Impacts on amenity in these areas are identified and assessed in the relevant sections of the EIS and include traffic and transport (Section 9.3.2), air quality (Section 10.8), and noise and vibration (Section 12.4.2).

Based on the operational traffic assessment carried out for the project (Section 9.3.2 of the EIS), parts of the existing road network around the western surface works have been identified as experiencing increases in traffic volumes as a result of traffic redistribution, including Moorefields Road. The potential noise and air quality impacts of increased traffic on amenity were assessed in the EIS.

The noise assessment concluded that noise levels would generally increase by one dB(A) or less along parallel routes such as Moorefields Road. This level of increase is generally considered to be indiscernible and is not anticipated to impact negatively on amenity.

Consistent with the *Road Noise Policy* (EPA, 2011), all feasible and reasonable management measures would be considered to reduce the extent to which road traffic noise exceeds applicable assessment criteria at receiver locations. The EIS concluded that one receiver at the western surface works would be eligible for further consideration of feasible and reasonable noise management measures.

The identification and evaluation of feasible and reasonable management measures for this location includes a combination of at-source treatments (such as low noise pavement selection), noise barriers and potential at-property acoustic treatments and is included in Section 12.5.2 of the EIS. The proposed management measures would be confirmed during detailed design of the project, including confirmation of other receiver locations that would be eligible for consideration of at-property acoustic treatments.

In relation to air quality, the project is expected to result in lower total air pollutant concentrations across the project corridor. Specifically, the project is anticipated to redistribute the impacts associated with emissions derived from vehicles using surface roads. The spatial changes in air quality as a result of the project would be quite complex, reflecting the complex changes in traffic on the surface road network. Substantial reductions in vehicle emissions concentrations have been predicted along the M5 East Motorway east and west of the existing M5 East Motorway tunnels, as well as along General Holmes Drive and other roads around the airport.

Reductions in concentrations were also predicted along the section of King Georges Road to the north of the M5 East Motorway, around the northern perimeter of Sydney Park, and on a number of other roads. However, increases in concentration have been predicted for King Georges Road to the south of the M5 East Motorway, along Stoney Creek Road, Bexley Road to the south of the M5 East Motorway, Harrow Road, Bay Street, Forest Road, and around the southern perimeter of Sydney Park, amongst other roads.

Where increases in pollutant concentration at receivers were predicted, these were mostly small. Very small proportions of receivers have been predicted to have larger increases.

Further detail on the assessment of air quality impacts is provided in **Section 5.9** of this report.

Issue description – other impacts on local amenity

Submissions raised general concerns that the operation of the project would result in amenity impacts on residents, including children. In particular submissions were concerned about:

- Losing the ‘community feel’
- Adversely affecting communities and local amenities
- Amenity impacts from infrastructure
- Amenity impacts on quiet residential streets due to increased traffic.
- Amenity impacts due to widening of roads
- Impact on quality of life by close proximity to traffic
- Impacts to the sense of belonging and identity of residents and consequently their cohesion and connectedness
- Impacts to privacy through bus stop relocations.

Response

Potential impacts to amenity during the operation of the project may occur as a result of:

- Increases in noise and vibration associated with increases in road traffic
- Decreased air quality associated with increased road traffic, the operation of ventilation facilities and emergency smoke extraction facilities

- Changes in visual amenity due to permanent operational facilities
- Changes in commuting behaviour and air quality resulting in changes in the health of residents and road users.

Without the project, traffic volumes on key local roads around St Peters including Campbell Road / Campbell Street and Euston Road (which abut Sydney Park) are generally expected to increase due to projected population growth in the area. Intersection performance along local roads around St Peters interchange would also deteriorate as a result of the associated traffic growth.

Without the local road upgrades and the WestConnex project, this forecast growth in traffic would cause further congestion, with the network unable to accommodate the expected demand. By 2031, motorists travelling in the afternoon peak would experience significant congestion compared to today. This is forecast to result in a 67 per cent increase in travel times, a 40 per cent decrease in speeds and increasing delays at some intersections.

When complete, the upgrades to local roads around the St Peters interchange and Sydney Park would create substantial new capacity along Campbell Street and Euston Road and direct through traffic along these routes and away from residential properties along other suburban streets in the area. In 2019 when the M5 is complete but Stage 3 (M4-M5 Link) is not, motorists would have three routes to choose from at St Peters Interchange to get to their destination. This includes Campbell Street / Road at St Peters, Euston Road at Alexandria and a new bridge over the canal to Bourke Road at Alexandria. With the completion of Stage 3 (M4-M5 Link), additional through traffic would be diverted into the motorway network, further easing impacts on local road networks.

The diverting of through traffic from local roads onto these upgraded roads around the St Peters interchange, as well as onto the WestConnex tunnels, would be instrumental in improving safety for pedestrians and cyclists around the St Peters interchange and Sydney Park, improving amenity for residents and users of this area.

Further, in response to the exhibition of the EIS, and in response to submissions that raised concerns relating to pedestrian connectivity and safety, a number of changes have been made to the local road upgrades described in Chapter 5 of the EIS. Changes to the local upgrades affect:

- Euston Road / Sydney Park Road / Huntley Street intersection
- Albert Street and Campbell Road intersection
- Change to the shared path within Sydney Park
- New Campbell Road (extension) / Southend Distribution Centre intersection.

Changes to the local road upgrades in these locations are described further below and within **Section 7.2** of this report.

Minor, partial acquisition of Sydney Park would be required for the project, including strip acquisition along Euston Road. As Sydney Park is a highly valued green space within the local community, used by a number of people for various sporting, recreational, pedestrian and cycling activities, this may be perceived as a negative effect on the park user's sense of place and the perceived identity of the surrounding community. However, recreational use of the park, including the use of walking and cycle paths within the park, would not be affected by the partial acquisition.

However, in response to submissions concerning the design of Euston Road and impacts to Sydney Park, Roads and Maritime would investigate the ability to further reduce the width of Euston Road during detailed design through one or both of the following:

- Reductions in the lane widths
- Minimising the extent of, or need for the central turning lane along Euston Road.

This investigation would consider the changes to network performance, road safety for all users (including pedestrians) and implications for access to properties along Euston Road. It would also consider the benefits resulting from a reduction in road width to pedestrian crossing distances and times, as well as opportunities for:

- Reduced impacts to Sydney Park, including loss of park space and mature trees
- Additional roadside landscape treatments
- Repositioning the shared path on the western side of Euston Road further away from the kerbside lane to improve user amenity.

An environmental management measure has been included in **Chapter 8** (Revised environmental management measure) of this report to reflect this commitment.

The project would also deliver around 14 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.

At present the pedestrian and cycling network in and around St Peters is fragmented, with a number of missing links, infrastructure of varying quality and a lack of safe, convenient crossings. A summary of the key locations and how the New M5 would improve existing conditions is provided below. These upgrades would significantly improve safe connections into Sydney Park, improving the amenity of the area for pedestrians and cyclists.

Campbell Street

Campbell Street contains footpaths immediately adjacent to the northern and southern sides of the road, which are of varying quality. At present the width of these paths varies with some sections as little as 1.2 metres wide. There are no street trees or dedicated cycling facilities.

As part of the project, pedestrian footpaths would feature on both sides of the street, with consistent width and paving materials. A dedicated cycleway would be constructed on the northern side of the road and street trees would line the both sides of the street. At Simpson Park the street tree canopy would be selectively planted to ensure the existing figs within the park are featured. Both the pedestrian footpaths and cycleway would be separated from the road via a combination of street trees and landscape verges.

Euston Road

At present the pavement on the western side of Euston Road is fairly regular, however its width does not adequately accommodate a shared pedestrian and cycle zone. Street tree plantings on the western side are generally consistent and feature a mature canopy. The path on the eastern side of Euston Road is irregular in width and quality.

Project works along Euston Road would create a dedicated shared path on the western side of adequate width to accommodate both pedestrian and cycle movements. The shared path would be separated from the roadway through a landscaped verge. Through further investigation of lane widths, Roads and Maritime would determine whether elements of the existing street trees on the western side can be retained. The eastern side would include street tree plantings where possible, with the remainder of the street retaining the existing trees.

Pedestrian connectivity would be enhanced through the installation of dedicated crossings at signalised intersections, none of which exist at present.

Sydney Park Road

There is currently a pedestrian footpath on the southern side of Sydney Park Road that is of good quality. Semi mature trees currently line the street.

The project would continue the shared path of Euston Road on the southern side of Sydney Park Road up to the extent of local road upgrade works. This would complement the existing cycle route in this location and also better accommodate both pedestrian and cycle movements through increased path width. A crossing at the intersection of Sydney Park Road and Euston Road would provide a new connection for pedestrians and cyclists in this location.

Gardeners Road

The western extent of Gardeners Road currently contains footpaths of varying quality and width. Street trees line the majority of the street, however the species are varying.

Project works along Gardeners Road would upgrade the pedestrian footpaths with regular width and materials, improving the amenity and safety for pedestrians. Street trees would be included where possible, given building setback would become closer to the roadway.

Bourke Road

The section of Bourke Road between Gardeners Road and the project extension of Campbell Street features pedestrian paths of varying quality and width. The Bourke Street cycleway begins in this location, just north of the existing Thrifty car rental premises. Streets trees on the eastern side are mature, but irregular in pattern.

The most significant addition as a result of the project would be a connection between the northern and southern extents of the Bourke Street cycleway with a dedicated crossing over Gardeners Road. This would ensure that cyclists do not have to dismount and cross Gardeners Road. Pedestrian footpaths would be improved in terms of both quality and regular width, both north and south of Gardeners Road. Street tree planting would be included on both sides of the street and be regular in pattern and species selection.

Road traffic noise levels at a total of 145 residential sensitive receivers exceeded the $L_{Aeq(9hour)}$ noise assessment criterion. In accordance with the *Noise Mitigation Guideline* (RMS, 2015) it was not reasonable to consider additional noise management measures at receivers that would experience an increase in road traffic noise levels of 2 dB(A) or less, and which were not considered 'acute.' As such a total of 144 residential receivers were considered for additional noise management measures.

In addition, one school building at St Peters Public School and the St Peters Community Pre-school (which is classified as a childcare centre under the NSW Road Noise Policy) are eligible for consideration of additional noise mitigation during the daytime only.

The St Peters community pre-school is eligible for consideration for both external and internal areas of the property. Nearby areas of Sydney Park and the majority of Simpson Park (active recreation areas) would be exposed to road traffic noise levels which also exceed the applicable noise assessment criteria. Road traffic noise levels at all other childcare centres, commercial properties and places of worship are predicted to comply with the criteria.

The eligibility of St Peters Public School and St Peters Community Pre-school for noise mitigation would be confirmed during detailed design and based on measured noise measurements specific to these locations.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken to meet the project noise requirements.

The project is expected to result in a reduction in total pollutant levels in the broader community, and a redistribution of impacts associated with vehicle emissions specifically in relation to emissions derived from vehicles using surface roads. The spatial changes in air quality as a result of the project would be quite complex, reflecting the complex changes in traffic on the surface road network. Substantial reductions in vehicle emissions concentrations have been predicted along the M5 East Motorway east and west of the existing M5 East Motorway tunnels, as well as along General Holmes Drive and other roads around the airport.

Reductions in concentrations were also predicted along the section of King Georges Road to the north of the M5 East Motorway, around the northern perimeter of Sydney Park, and on a number of other roads. However, increases in concentration have been predicted for King Georges Road to the south of the M5 East Motorway, along Stoney Creek Road, Bexley Road to the south of the M5 East Motorway, Harrow Road, Bay Street, Forest Road, and around the southern perimeter of Sydney Park, amongst other roads.

Where increases in pollutant concentration at receivers were predicted, these were mostly small. Very small proportions of receivers have been predicted to have larger increases.

Further detail on the assessment of air quality impacts is provided in **Section 5.9** of this report.

Residents, road users, community facilities users, pedestrians and cyclists are likely to experience changes in visual amenity due to the introduction of new operational infrastructure. Impacts to visual amenity from operational infrastructure would be managed through Landscape and Urban Design Plans developed for the project, prepared in consultation with the New M5 Urban Design Review Panel, relevant local councils within the project corridor and the local community. Through implementation of an overarching urban design vision and careful analysis of context, the project would integrate with the surrounding urban landscape and provide peripheral benefits for local and regional communities.

Forecast traffic volumes indicate that King Georges Road, Stoney Creek Road and the Princes Highway would experience increases in traffic after the opening of the project due to some drivers diverting through these roads to avoid motorway tolls on the M5 East Motorway and the New M5. This effect is most likely to occur outside peak traffic periods, when there is generally spare capacity across the network. During peak periods these arterial roads are already at capacity and there is less incentive to divert from the motorway in order to avoid the toll. However, as these parallel routes would generally see an increase in traffic volumes during the period when there is generally spare capacity in the network (the times outside of the morning and afternoon peak periods) the potential for impacts to amenity along these routes would be negligible.

This redistribution of traffic has the potential to have a road traffic noise impact on receivers located on parallel routes. These routes comprise roads which have not been considered as project roads. The *Noise Criteria Guideline* considers any project to be a traffic generating development if it is predicted to increase noise levels by greater than 2.0 dB(A) on any other road. Therefore an assessment of the potential impacts is required.

The assessment in Section 6.1.11 of the Technical working paper: Noise and vibration (Appendix J of the EIS) shows that generally noise levels would increase by 1 dB(A) or less, which is generally considered to be indiscernible. Further consideration of the impacts on parallel routes was therefore not required.

The project would also deliver around 14 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.

Throughout the development of the project design, active transport (pedestrian and cyclist infrastructure) has been a key consideration. Following exhibition of the EIS and in response to submissions, additional work has been undertaken to build on the work completed to date, and to ensure pedestrian and cyclist facilities are consistent with existing State and local government policies and strategies.

New active transport infrastructure in the St Peters, Mascot and Alexandria precincts would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure.

5.14.4 Impacts on economic output

90 submitters raised issues regarding impacts on economic output.

Issue description – economic impacts of St Peters interchange

Submissions objected to the St Peters interchange on the grounds that it would have adverse impacts on the economy.

Response

Chapter 15 and Appendix M (Technical working paper: Social and economic) of the EIS detail the assessment of economic impacts during construction and operation of the project including impacts associated with the construction of new surface infrastructure, such as St Peters interchange.

Construction of the project would be of significant benefit to the economy. Project expenditure would inject economic stimulus benefits into the local, regional and state economies. Local businesses would principally benefit from this expenditure through purchases made by construction businesses

and associated workers to build and support the development of the project. The EIS concluded that construction of the project would directly and indirectly contribute an estimated $1.8 billion output, $400 million of household income, around 4390 annual full-time equivalent jobs and an additional $670 million to the NSW economy per average year of construction (refer to Section 5.2 of the Technical working paper: Social and economic in Appendix M of the EIS).

Operational expenditure is estimated to contribute a total of $44 million in output, around $10 million in household income, 116 full-time equivalent jobs and an additional $18 million in to the NSW economy per year of operation (refer to Section 6.2 of the Technical working paper: Social and economic in Appendix M of the EIS).

The St Peters interchange would be located mostly on land occupied by the former Alexandria Landfill. The operations of the previous landowner ceased on this site in December 2014, following the acquisition of the site by the NSW Government. The site no longer accepts waste, and is being managed under existing development consents and Environment Protection Licences.

Construction and operation of the project would result in the permanent closure of the Alexandria Landfill, and permanent removal of this commercial operation from the regional economy. Potential broader impacts associated with the landfill closure may include changes in the commercial and industrial waste haulage costs and an associated change in productivity for the region. A number of other waste transfer, recovery and recycling facilities are more broadly spread across metropolitan Sydney, and a number of facilities remain in the general vicinity of the project. As such, the impacts on the regional economy associated with this industry given the loss of recycling, storage and transfer functions at the site were unlikely to be significant.

The project may also impact on the local and regional economy through amenity impacts on businesses surrounding St Peters interchange. Businesses in and around St Peters are located in clusters along:

- Princes Highway at St Peters and Tempe
- Campbell Street and Euston Road at St Peters and Alexandria
- King Street at St Peters and Newtown
- Botany Road and Gardeners Road at Mascot Alexandria.

The majority of businesses in close proximity to construction compounds are industrial and commercial businesses whose business activities are not considered to be dependent on amenity. As a result the likely impact of noise, vibration, air quality and visual amenity would be limited. Consequently, the project would have a minimal impact on the ability of these businesses to contribute to the local and regional economy. The impact of property acquisition would have both short-term impacts (during construction of the project) and medium to long-term impacts (during operation of the project). The economic impacts would be associated with the potential loss of employment and turnover. Impacted businesses may choose to close down or relocate within the region. This could result in the loss of income for employees and owners and a loss in output in the region. These businesses may cater to the specific needs of residents or industries in the local community and may result in flow-on effects within the region.

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 impacted 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.

The EIS concluded that during operation, businesses located along the Princes Highway between the M5 East Motorway and the St Peters interchange, where traffic levels are anticipated to decrease due to the project may experience improved amenity due to reduced traffic levels. Improved amenity and accessibility due to the project may facilitate urban renewal of this area, attracting businesses that would benefit from improved amenity. Further, as there would not be any significant changes to traffic volumes and no modifications to King Street are proposed as part of this project, the project would not have a significant impact on businesses or amenity along King Street.

5.14.5 Compensation

16 submitters raised issues regarding compensation as a result of the project.

Issue description – queries regarding compensation

Submissions generally queried whether compensation would be available to residents and businesses for general impacts and in particular for the following reasons:

- To insulate homes from noise impacts
- For additional electricity costs associated with running air conditioning if windows cannot be opened due to high dust particles
- For loss of value, if property prices are affected
- For any impact on rental returns
- For impacts to health
- To clean and make any repairs caused by construction of the New M5
- To increase fence height and install CCTV.

Further information regarding the process for claiming compensation was also requested.

Response

In accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW), compensation to land owners is only payable when land is acquired for the particular project.

Compensation for other perceived impacts or acquisition of other properties is not proposed, based on the demonstration in the EIS that the potential impacts of the project would be within acceptable limits.

Prior to the commencement of construction works, existing condition surveys would be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works. Copies of these reports would be provided to the property owner. In the unlikely event of damage caused by the construction of the New M5 project, this would be rectified by Roads and Maritime at no cost to the property owner.

The operational noise assessment identified that a total of 145 residential receivers would experience increased road noise levels in excess of the relevant noise criteria and would be eligible for consideration of noise mitigation through at-property treatment. In addition, the EIS identified two school buildings at the St Peters Public School as being eligible for consideration of noise mitigation during the daytime only. One of these buildings is in fact the St Peters Community Pre-school (with frontage at 18 St Peters Street, St Peters and Church Street), which would be eligible for consideration of noise mitigation for internal and external areas of the property. This has been clarified in **Section 6.5.2** of this report. The provision of at property noise mitigation would be undertaken in consultation with and at no cost to the affected property owners.

5.14.6 Displacement of businesses

2,063 submitters raised issues regarding the displacement of businesses as a result of the project.

Issue description – community impacts from business acquisition

Submissions raised general concerns regarding the displacement of businesses as a result of land acquisitions required for the project. Submissions raised concerns regarding the impacts on the community as a result of the displacement of businesses, specifically for the stress and trauma of business-owners, for the loss of shops and amenities within local communities and the breaking up of established communities.

Response

The project has been designed to minimise the need for land acquisition, where feasible and reasonable. Given the limited availability of space in the project area 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.

All acquisition required for the project is undertaken in consultation with the affected landowners in accordance with the Roads and Maritime Services Land acquisition information guide (Roads and Maritime 2014b) and the Land Acquisition (Just Terms Compensation) Act 1991 (NSW).

Ongoing consultation with residents and communities that may be affected by the project assists in reducing uncertainty by providing relevant information about the project and an opportunity to become aware of, suggest improvements to, and adjust to the changes. Consultation with affected property owners would continue during detailed design and through to construction. Future consultation arrangements are discussed in **Chapter 2** (Community involvement) of this report.

While the EIS acknowledges 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:

- Increased accessibility to businesses along Princes Highway between the M5 East Motorway and St Peters interchange due to decreased congestion. Increased accessibility and improved amenity along this section of the Princes Highway may encourage new and diverse businesses into the region and provide the opportunity for urban renewal
- Greater connections between residential communities and locations of employment as a result of decreased travel times and congestion
- More efficient freight movement between western and south-western Sydney, as well as interstate and interstate and international markets through connections with the wider National Land Transport Network, Sydney Airport and Port Botany.

A number of submissions were concerned for the wellbeing of business owners affected by property acquisition and subsequent relocation. It is noted that Access to the WestConnex Assist support service is available to people directly affected by the project.

Section 5.2.3 of Appendix M of the EIS discusses the various business impacts associated with the property acquisition process. 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 impacted 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.

Section 5.2.3 of Appendix M of the EIS discusses the impact to business amenity arising from project operation. Permanent changes in amenity that may impact businesses during the operation of the project would occur as a result of:

- Increases in noise and vibration associated with increases in road traffic
- Decreased air quality associated with increased road traffic, the operation of ventilation outlets and smoke extractors
- Changes in visual amenity due to permanent operation facilities.

As the majority of businesses in close proximity to the New M5 corridor are industrial and commercial businesses, the impact of noise, vibration, air quality and visual amenity are limited. These businesses are not considered sensitive receivers as their business activities are not dependent on amenity. Due to the activities that generally take place in these types of businesses, the working

The increase road traffic noise on alternative routes is expected to be within, within accepted criteria. Businesses located along the Princes Highway between the M5 East Motorway and the St Peters interchange, where traffic levels are anticipated to decrease due to the project, may experience improved amenity due to reduced traffic levels. Improved amenity and accessibility due to the project

may facilitate urban renewal of this area, attracting businesses that would benefit from improved amenity.

The project does not propose to modify King Street, including speed limits or on-street parking arrangements along King Street. In future years, traffic modelling indicates that King Street is expected in most cases to experience reduced or similar peak hour volumes under the 2021 'with project' scenario and 2031 cumulative scenario when compared to the without project scenario (refer to Technical Working Paper: Traffic and Transport (AECOM, 2015a). The exception to this would occur in the 2031 cumulative case, where AM peak hour volumes southbound would increase by around 280 vehicles per hour when compared to the 'without project' scenario. However, this is in the opposing direction to the dominant AM peak hour (which would experience a reduction) and is within the design carrying capacity of the road. As there would not be any significant changes to traffic volumes or no modifications to King Street are proposed as part of this project, the project would not have a significant impact on businesses or amenity along King Street.

As discussed above in **Section 5.14.1** of this report, the project would improve connectivity between communities by reducing congestion and delivering travel time savings along the M5 Motorway corridor. By reducing congestion, the project would enhance connectivity and active movement across major transport corridors for local communities. Reducing congestion and improving travel times would also help to connect residential communities in south-west Sydney with locations of employment in the east. The EIS (refer to Section 15.3.2) concluded that is anticipated to have a positive impact on the sense of connectedness and community cohesion within the wider community.

5.14.7 Displacement of residences

2,167 submitters raised issues regarding the displacement of residences as a result of the project.

Issue description – community impacts from property acquisition

Submissions raised concerns that the social impact assessment dismisses the community impacts associated with the compulsory loss of homes and businesses, particularly on long-term renters citing that there is little if any equivalent stock available nearby. Additional submissions raised concern that the acquisition of properties would cause undue stress, mental health impacts, psychological distress to those impacted and the breaking up of established communities.

Response

Services are available to support residents who are being relocated as a result of property acquisition including:

- Access to the WestConnex Assist counselling service
- Provision of an independent service to vulnerable households to assist with their relocation
- Community relations support to respond to community issues, concerns and requests and to offer a translation service to households for whom English is a second language.

Residents who are having their properties acquired or are relocating due to the project (e.g. tenants) have been advised to contact WestConnex directly to discuss available support services.

The social impact assessment at Appendix M (Technical working paper: Social and economic) of the EIS has been prepared in accordance with the SEARs and the relevant provisions of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. Further, the social and economic impact assessment has been undertaken in accordance with the guidance presented in the *Roads and Maritime Services Socio-economic Assessment Practice Note* (Roads and Maritime Services, 2013). A comprehensive level of assessment has been adopted in accordance with Roads and Maritime's guidance. Section 2.0 of Appendix M (Technical working paper: Social and economic) of the EIS details the methodology used in the social and economic impact assessment.

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/social networks.

As discussed above in Section 5.14.1, the project would improve connectivity between communities by reducing congestion and delivering travel time savings along the M5 Motorway corridor. By reducing congestion, the project would enhance connectivity and active movement across major transport corridors for local communities. Reducing congestion and improving travel times would also help to connect residential communities in south-west Sydney with locations of employment in the east. The EIS (refer to Section 15.3.2) concluded that this would deliver a positive impact on the sense of connectedness and community cohesion within the wider community.

Issue description - impacts from the displacement of the elderly and disabled

Submissions raised concern regarding the social impacts in St Peters from the displacement of elderly and disabled residents, which may lead to increased isolation particularly for those who were in their own or rented flats.

Response

Given the limited availability of space in the project area, some property acquisition would be required to facilitate construction of the project.

All acquisition required for the project would be undertaken in consultation with landowners in accordance with the *Roads and Maritime Services Land acquisition information guide* (Roads and Maritime 2014) and the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW).

The services available to support residents, including the elderly and disabled, who are being relocated as a result of property acquisition are detailed in Section 6.2 of Appendix M of the EIS and include:

- The WestConnex Assist counselling service
- Provision of an independent service to vulnerable households to assist with their relocation
- Community relations support to respond to community issues, concerns and requests and to offer a translation service to households for whom English is a second language.

Owners who are having their properties acquired and tenants who need to relocate due the New M5 project have been advised to contact WestConnex directly, through the WestConnex Assist counselling service to discuss available support services.

5.14.8 Construction impacts on facilities

No issues raised in community submissions were categorised as ‘impacts on facilities’.

5.14.9 Operational impacts on facilities

48 submitters raised issues regarding impacts on facilities during project operation

Issue description – impacts of operation on community facilities on schools

Submissions raised concerns that the operation of the project would impact on and strain community facilities, including local schools and in particular, St Pius Primary School located on Edgeware Road.

Response

The social and economic assessment in Chapter 15 and Appendix M (Technical working paper: Social and Economic) of the EIS provides an assessment of impacts on community facilities resulting from the project. Community facilities could experience various impacts during operation of the project, including noise and vibration (Chapter 12 of the EIS), traffic (Chapter 9 of the EIS), visual impacts (Chapter 14 of the EIS) and air quality (Chapter 10 of the EIS). 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 identified as being within the study area is provided in Appendix B, of Appendix M of the EIS. This list includes educational facilities, sporting facilities, places of worship, community halls and libraries.

Educational facilities located within the immediate vicinity of project works were detailed in Table 15-2 and their locations were mapped on Figure 15-2 to Figure 15-5 of Chapter 15 of the EIS. Table 15-2

identifies those facilities which were deemed as being within the immediate vicinity of the project and therefore required further assessment. Those facilities which lie outside of the immediate project area are considered to be outside of the area of significant impact and therefore are not included in the social and economic assessment.

One school building at St Peters Public School and the St Peters Community Pre-school (which is classified as a childcare centre under the NSW Road Noise Policy) are eligible for consideration of additional noise mitigation during the daytime only.

The St Peters community pre-school is eligible for consideration for both external and internal areas of the property. Nearby areas of Sydney Park and the majority of Simpson Park (active recreation areas) would be exposed to road traffic noise levels which also exceed the applicable noise assessment criteria. Road traffic noise levels at all other childcare centres, commercial properties and places of worship are predicted to comply with the criteria.

The eligibility of St Peters Public School and St Peters Community Pre-school for noise mitigation would be confirmed during detailed design and based on measured noise measurements specific to these locations.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable management measures would be undertaken to meet the project noise requirements.

Accessibility to St Peters Public School would be greatly improved by the following:

- Additional on-street car parking on Campbell Street
- New off-street parking on St Peters Street
- At grade signalised pedestrian crossing across at Campbell Street
- Improved active transport measures along the Campbell Street and Campbell Street / Campbell Road corridor
- Removing the desire for rat running on local streets (i.e. Church Street) as a result of opening up turning movements at the Campbell Street / Princess Highway intersection
- Provision of a signalised intersection at Campbell Street offering full turning movements for vehicles entering and leaving the school from St Peters Street.

5.14.10 Construction impacts on open space

165 submitters raised issues regarding impacts on open space during project construction.

Issue description – impacts of construction compounds on open space

Submissions expressed concern with the impact to local residents and the community from the use of locally significant open / green space and public parklands (including Sydney Park, Beverly Grove Park and the southern wetlands at Marsh Street) for construction compounds.

Response

Construction compounds have the potential to directly (through acquisition) and indirectly (through impacts on amenity) impact on open space. The impacts on land use including open space are assessed in Section 13.3 of the EIS.

Existing public open space occupied by construction compounds would be rehabilitated and returned for public recreation at the end of construction or other uses permitted under the applicable environmental planning instruments, following completion of construction (except where the land is required for permanent operational infrastructure). As construction works are only temporary, this impact on existing public open space would not be significant.

Amenity impacts on open space from construction have been identified and assessed within the relevant sections of the EIS including air quality (Chapter 11), noise and vibration (Chapter 12), traffic (Chapter 9), land use and property impacts (Chapter 13) and visual impacts (Chapter 14). With the

implementation of the revised environmental management measures, construction of the project is not anticipated to have a significant impact on open space.

5.14.11 Operational impacts on open space

4,276 submitters raised issues regarding impacts on open space during project operation.

Issue description – permanent loss of public open space within Sydney Park

Submissions raised concerns regarding the permanent loss of public open space within Sydney Park as a result of the project, and in particular that:

- The natural and social value of the park has not been considered
- Concern for impact to wildlife within Sydney Park
- Concern for the loss of this 'cool spot' within the CBD
- The project would require the loss of 1.4 hectares of Sydney Park
- Sydney Park had recently been developed and that this would be lost with the project
- The proposed road intrusion has a thoughtless and damaging effect on this AIDS Memorial Grove.

Response

As described in Chapter 13 of the EIS, temporary and permanent occupation of areas of Sydney Park would be required for the project. This would include temporary partial acquisition adjacent to Campbell Road to facilitate construction of the pedestrian bridge across Campbell Road and permanent strip acquisition along Euston Road, as well as temporary occupation of land required to accommodate the Sydney Park construction compound (C14). Areas of Sydney Park recently completed as part of the Sydney Park Stormwater Reuse Upgrade would not be impacted by the proposed works.

Around 0.2 hectares of City of Sydney land adjacent to the road corridor within Sydney Park would be acquired. This represents around 0.56 per cent of the total area of Sydney Park. An additional 0.55 hectares would be leased or temporarily occupied for construction purposes from City of Sydney and returned to recreational uses following the completion of construction. Around 146 square metres of Sydney Water land adjacent to the road reserve within Sydney Park would also be acquired.

In total, around 0.76 hectares (7600 square metres) would be required for construction of the project, 0.55 hectares of which would be rehabilitated and returned to its original use at the completion of construction.

The permanent partial acquisition of land for the footprint of the bridge and pedestrian and cycle paths is consistent with, and a beneficial addition, to the current public open space available in Sydney Park. New active transport infrastructure in the St Peters, Mascot and Alexandria precincts would significantly improve and encourage active transport use for both commuters and recreational users, creating a vital new east-west active transport corridor and completing missing north-south active transport connections to current and future active transport infrastructure.

In addition, commitment has also been made to investigating during detailed design the option to further reduce the width of the upgraded Euston Road through lane width reductions and/or the removal or reduction of the central turning lane (refer to **Chapter 8** (Revised environmental management measures) of this report). The investigation would consider road safety, network performance and implications on property access. The investigations would also consider:

- Benefits of reduced impacts to Sydney Park including loss of park space and vegetation
- Improvements to pedestrian crossing distances and times improving pedestrian connectivity across Euston Road
- Potential to shift the proposed shared path on the western side of Euston Road away from the kerb improving the safety and amenity of active transport users

- Potential for additional landscape treatments to increased verge spaces as a result of reduction in roadspace.

The assessment of socio-economic impacts on recreation and community facilities as described in Chapter 15 of the EIS found that recreational uses of Sydney Park, including the use of walking and cycling paths within the park, are not anticipated to be affected by either the partial acquisition or temporary occupation (e.g. during construction).

As shown in Sydney Park Plan of Management 2014 (City of Sydney, 2014), the AIDS Memorial Grove is located in the western portion of Sydney Park, north-west of the council depot and nursery. This area is located outside of the Sydney Park areas identified for the construction compound and permanent acquisition (refer to Figure 13-9 and Figure 13-13 of the EIS)

Issue description – impacts on access to Sydney Park

Submissions expressed concern that the road upgrades in the vicinity of Sydney Park would make the park more difficult to access.

Response

The project would facilitate increased access to Sydney Park through the introduction of new road, public transport and pedestrian / cycle infrastructure.

Local road upgrades in the vicinity of the St Peters interchange are described in Section 5.7 of the EIS and include widening of Euston Road and Campbell Road, and the upgrading of a number of intersections. These upgrades are required to ensure safe and efficient connections with the New M5, and to assist in managing additional traffic demands. As stated in Section 5.7.9 of the EIS, the local road upgrades would facilitate new and upgraded pedestrian and cycle infrastructure with a focus on maintaining and improving pedestrian and cyclist accessibility and connectivity.

Chapter 6 of the Technical working paper: Social and economic in Appendix M of the EIS assessed the potential impacts on recreational and community facilities and changes to accessibility as a result of the project. The assessment found that pedestrian and cycle infrastructure to be provided as part of the project, including the Campbell Road pedestrian and cycle bridge, would enhance opportunities for communities south and east of the project to access Sydney Park, as well as providing a regional cycle connection between Mascot and Marrickville.

Improvements to pedestrian and cycle access to Sydney Park would include the construction of the Campbell Road pedestrian and cycle bridge, which would connect the existing Bourke Road cycle path to Sydney Park and provide dedicated pedestrian and cyclist access over the St Peters interchange on and off ramps, the Alexandra Canal and the upgraded Campbell Road.

In addition, widening of Euston Road between the upgraded Campbell Road / Euston Road intersection and the intersection with Maddox Street north of Sydney Park Road (refer to Section 5.7, Figure 5-29 and Figure 5-30 of the EIS) would include pedestrian and cycle facilities constituting:

- A shared pedestrian and cyclist path on the western side of Euston Road and a pedestrian path on the eastern side of Euston Road. These facilities would integrate with existing pedestrian and cycle facilities, where they exist
- Retention of the signalised pedestrian crossing providing access to Sydney Park at the upgraded Euston Road / Campbell Road intersection
- A new signalised pedestrian crossing across Euston Road around 180 metres north of the Euston Road / Campbell Road intersection
- Upgrading of the Euston Road / Sydney Park Road / Huntley Street intersection to a signalised intersection. As part of this upgrade, new signalised pedestrian crossings would be provided in all directions, improving connectivity to and from Sydney Park at this location.

The project does not include works on the western or northern boundaries of Sydney Park. Access to the park from these orientations would continue to be provided via existing signalised intersections. However, there is potential for this access to be improved through revisions to the King Street / Sydney Park Road / Princes Highway intersection. Roads and Maritime has committed to working

with the local councils in developing a solution for a reconfiguration of this intersection which would further improve residents access to Sydney Park.

Issue description – permanent loss of open space within Kogarah Golf Course

Submissions raised concerns regarding the permanent loss of open space within Kogarah Golf Course associated with the Arncliffe motorway operations complex (MOC3).

Response

The Arncliffe construction compound (C7) and Arncliffe motorway operations complex (MOC3) would be located on land owned by Roads and Maritime and Rockdale City Council. The partial acquisition and use of the Kogarah Golf Course during construction would result in the temporary reduction of the facility from an 18-hole course to a 9-hole course. Information regarding business impacts resulting from the partial acquisition of the project is discussed in Section 5.2.3 in Appendix M of the EIS. The footprint for the Arncliffe construction compound has been negotiated with Kogarah Golf Course to assist with maintaining a 9-hole course, and to avoid infrastructure on the course where possible, such as water storage tanks.

The footprint of the motorway operations complex has been minimised to reduce potential impacts on the ongoing operation of the golf course, until the golf course site is developed consistent with *Sydney Regional Environmental Plan No. 33 – Cooks Cove* or an equivalent environmental planning instrument in the future.

At the completion of project construction, any land temporarily occupied for construction of the project at the Kogarah Golf Course has the potential to be rehabilitated and returned to its original land use (possibly reconfigured within the construction footprint).

Issue description – operational impacts on the amenity of Sydney Park

Submissions objected to the project on the basis that increased traffic and motorway infrastructure would have negative impacts (including a decrease in public safety) on the amenity of Sydney Park.

Response

Without the project, traffic volumes on key local roads around St Peters including Campbell Road / Campbell Street and Euston Road (which abut Sydney Park) are generally expected to increase due to projected population growth in the area. Intersection performance along local roads around St Peters interchange would also deteriorate as a result of the associated traffic growth.

Without the local road upgrades and the WestConnex project, this forecast growth in traffic would cause further congestion, with the network unable to accommodate the expected demand. By 2031, motorists travelling in the afternoon peak would experience significant congestion compared to today. This is forecast to result in a 67 per cent increase in travel times, a 40 per cent decrease in speeds and increasing delays at some intersections.

When complete, the upgrades to local roads around the St Peters interchange and Sydney Park would create substantial new capacity along Campbell Street and Euston Road and direct through traffic along these routes and away from residential properties along other suburban streets in the area. In 2019 when the New M5 is complete but WestConnex Stage 3 (M4-M5 Link) is not, motorists would have three routes to choose from at St Peters Interchange to get to their destination. This includes Campbell Street / Road at St Peters, Euston Road at Alexandria and a new bridge over the canal to Bourke Road at Alexandria. With the completion of WestConnex Stage 3 (M4-M5 Link), additional through traffic would be diverted into the motorway network, further easing impacts on local road networks.

The diverting of through traffic from local roads onto these upgraded roads around the St Peters interchange, as well as onto the WestConnex tunnels, would be instrumental in improving safety for pedestrians and cyclists around the St Peters interchange and Sydney Park.

Further, in response to the exhibition of the EIS, and in response to submissions that raised concerns relating to pedestrian connectivity and safety, a number of changes have been made to the local road upgrades described in Chapter 5 of the EIS. Changes to the local upgrades affect:

- Euston Road / Sydney Park Road / Huntley Street intersection
- Albert Street and Campbell Road intersection
- Change to the shared path within Sydney Park
- New Campbell Road (extension) / Southend Distribution Centre intersection.

Changes to the local road upgrades in these locations are described further below and within **Section 7.2** of this report.

Minor, partial acquisition of Sydney Park would be required for the project, including strip acquisition along Euston Road. As Sydney Park is a highly valued green space within the local community, used by a number of people for various sporting, recreational, pedestrian and cycling activities, this may be perceived as a negative effect on the park user's sense of place and the perceived identity of the surrounding community. However, recreational use of the park, including the use of walking and cycle paths within the park, would not be affected by the partial acquisition.

However, in response to submissions concerning the design of Euston Road and impacts to Sydney Park, Roads and Maritime would investigate the ability to further reduce the width of Euston Road during detailed design through one or both of the following:

- Reductions in the lane widths
- Minimising the extent of, or need for the central turning lane along Euston Road.

This investigation would consider the changes to network performance, road safety for all users (including pedestrians) and implications for access to properties along Euston Road. It would also consider the benefits resulting from a reduction in road width to pedestrian crossing distances and times, as well as opportunities for:

- Reduced impacts to Sydney Park, including loss of park space and mature trees
- Additional roadside landscape treatments
- Repositioning the shared path on the western side of Euston Road further away from the kerbside lane to improve user amenity.

An environmental management measure has been included in **Chapter 8** (Revised environmental management measure) of this report to reflect this commitment.

The project would also deliver around 14 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.

At present the pedestrian and cycling network in and around St Peters is fragmented, with a number of missing links, infrastructure of varying quality and a lack of safe, convenient crossings. A summary of the key locations and how the New M5 would improve existing conditions is provided below. These upgrades would significantly improve safe connections into Sydney Park, improving the amenity of the area for pedestrians and cyclists.

Campbell Street

Campbell Street contains footpaths immediately adjacent to the northern and southern sides of the road, which are of varying quality. At present the width of these paths varies with some sections as little as 1.2 metres wide. There are no street trees or dedicated cycling facilities.

As part of the project, pedestrian footpaths would feature on both sides of the street, with consistent width and paving materials. A dedicated cycleway would be constructed on the northern side of the road and street trees would line the both sides of the street. At Simpson Park the street tree canopy would be selectively planted to ensure the existing figs within the park are featured. Both the pedestrian footpaths and cycleway would be separated from the road via a combination of street trees and landscape verges.

Euston Road

At present the pavement on the western side of Euston Road is fairly regular, however its width does not adequately accommodate a shared pedestrian and cycle zone. Street tree plantings on the western side are generally consistent and feature a mature canopy. The path on the eastern side of Euston Road is irregular in width and quality.

Project works along Euston Road would create a dedicated shared path on the western side of adequate width to accommodate both pedestrian and cycle movements. The shared path would be separated from the roadway through a landscaped verge. Through further investigation of lane widths, Roads and Maritime would determine whether elements of the existing street trees on the western side can be retained. The eastern side would include street tree plantings where possible, with the remainder of the street retaining the existing trees.

Pedestrian connectivity would be enhanced through the installation of dedicated crossings at signalised intersections, none of which exist at present.

Sydney Park Road

There is currently a pedestrian footpath on the southern side of Sydney Park Road that is of good quality. Semi mature trees currently line the street.

The project would continue the shared path of Euston Road on the southern side of Sydney Park Road up to the extent of local road upgrade works. This would complement the existing cycle route in this location and also better accommodate both pedestrian and cycle movements through increased path width. A crossing at the intersection of Sydney Park Road and Euston Road would provide a new connection for pedestrians and cyclists in this location.

Gardeners Road

The western extent of Gardeners Road currently contains footpaths of varying quality and width. Street trees line the majority of the street, however the species are varying.

Project works along Gardeners Road would upgrade the pedestrian footpaths with regular width and materials, improving the amenity and safety for pedestrians. Street trees would be included where possible, given building setback would become closer to the roadway.

Bourke Road

The section of Bourke Road between Gardeners Road and the project extension of Campbell Street features pedestrian paths of varying quality and width. The Bourke Street cycleway begins in this location, just north of the existing Thrifty car rental premises. Streets trees on the eastern side are mature, but irregular in pattern.

The most significant addition as a result of the project would be a connection between the northern and southern extents of the Bourke Street cycleway with a dedicated crossing over Gardeners Road. This would ensure that cyclists do not have to dismount and cross Gardeners Road. Pedestrian footpaths would be improved in terms of both quality and regular width, both north and south of Gardeners Road. Street tree planting would be included on both sides of the street and be regular in pattern and species selection.

Chapter 14 (Visual impacts and urban design) and Appendix K (Technical working paper: Visual impact) of the EIS presents an assessment of the visual and landscape impacts of the project, including in relation to the St Peters interchange and surrounding visual receivers. The outcomes of the visual impact assessment are summarised in Table 14-15 of the EIS and, with respect to the St Peters interchange, the assessment concluded that Potential visual impacts on recreational receivers including Sydney Park would be moderate.

It is recognised that the introduction of major road infrastructure such as the St Peters interchange into the local landscape has the potential to substantially alter the visual and landscape context, particularly for more sensitive residential and recreational receivers. It does, however, also offer the opportunity through careful design to improve the local landscape, including replacement of an existing industrial aspect across the Alexandria Landfill site width. The design strategy to be implemented at the St Peters interchange promotes the use of a tall, established tree canopy cover to

soften the scale of the proposed infrastructure and provide an extension of the green open space from Sydney Park.

The potential for increased traffic to impact on noise and vibration; air quality and visual amenity at receivers are identified and assessed within the EIS. Refer to Traffic and transport (Section 9.3.1) Air quality (Section 10.6), Noise and vibration (Section 12.4.1), and Visual impacts (Section 14.3.1).

Issue description – loss of open / green spaces and associated impacts

Submissions raised concerns regarding the liveability and amenity impacts of the project on open / green spaces and access to these spaces, citing that their enjoyment of the parks would be reduced due to the location next to a major highway. Specific areas mentioned in submissions are as follows:

- Bardwell Valley
- Wolli Creek Valley
- Alan Davison Oval
- M5 Linear Park
- Beverly Grove Park
- Camdenville Park
- Simpson Park.

Response

The project would be constructed largely within existing road reserves and efforts have been made to minimise the footprint. Notwithstanding, some temporary and permanent occupation of open space would be required for the project. The use of open space has reduced the need for additional private property acquisition. In most cases, land occupied for construction compounds and construction activities would be rehabilitated at the end of the construction period and returned for potential development.

Some areas of open space would be permanently required for the project and operational infrastructure including:

- Sections of the M5 Linear Park (in the Wolli Creek Valley) to accommodate the widening of the M5 East Motorway
- Beverly Grove Park
- A portion of Kogarah Golf Course
- A strip of Sydney Park along Euston Road. Alan Davison Oval is not within the impacted area.
- Areas in the vicinity of the Campbell Road and Sydney Park Road intersections with Euston Road
- May Street Reserve
- A small area along the western boundary of Camdenville Park.

Alternative areas of parkland and open space are available in the nearby area but are not part of the project. These areas provide similar recreational and sporting facilities, as well as pedestrian and cycle paths. As such, no significant impact on total open spaces / green spaces is anticipated.

Further, the project would result in enhancements to open space at the western surface works and around the St Peters interchange.

In the western part of the project, connectivity between existing areas of open space would be improved through upgraded shared paths within the M5 Linear Park. The shared paths would be enhanced by new landscaping which would assist in screening the motorway and associated noise barriers. The upgraded shared paths and landscaping would integrate with similar upgrades being undertaken for the King Georges Road interchange upgrade project.

In the eastern parts of the project, significant new areas of open space would be created around the St Peters interchange. A master plan has been developed, encompassing the entire interchange site

and ensuring its integration with surrounding areas. The majority of the open space to be provided by the master plan would be completed as part of the project. Specifically, the project would extend the parklands of Sydney Park further south, providing much needed open space for a growing population. Featuring landscape mounds, the design of the interchange parklands would continue the features of Sydney Park. This space would be accessible from shared paths in the east connecting to Sydney Park or via a dedicated entrance at the corner of Canal Road and Princes Highway.

Active transport infrastructure to be implemented as part of the project would improve connectivity for cyclists and pedestrians via provision of a more integrated network. The project would deliver around 14 kilometres of new or upgraded pedestrian and cyclist link, much of which would be physically separated from the road network.

While the project is not anticipated to directly impact on Simpson Park, the park may experience temporary amenity impacts during construction. These would be managed through the implementation of the revised management measures in **Chapter 8** of this report.

The project is not anticipated to affect open space in the Bardwell Valley.

Issue description – impacts on recreational space from removal of vegetation

Submitters have expressed concerns about the loss of recreational space associated with the removal of vegetation including Cooks River Clay Plain Scrub Forest. Submissions were also concerned that the loss of over 350 established trees and other vegetation for the widening Euston Road would expose residents to more heat, noise & exhaust pollution from traffic that would pour out of the tunnel onto Euston, Campbell and other local roads.

Response

The project would require the removal of up to 1.4 hectares of Cooks River Castlereagh Ironbark Forest (Cooks River Clay Plain Scrub Forest) within Beverly Grove Park. While the available area for recreation would be reduced, the function of the open space is unlikely to significantly change as a result of the project.

A flora and fauna management plan would be prepared to manage impacts of the project on the remaining areas of Cooks River Castlereagh Ironbark Forest within Beverly Grove Park.

Following completion of the project, revegetation at Beverly Grove Park would include local species from existing and adjoining plant communities and would assist in protecting and recovering local biodiversity and amenity of the recreational space.

Refer to Chapter 21 (Greenhouse Gas and climate Change), Section 5.21.2, for information regarding the urban heat island effect, Chapter 10 (Noise and Vibration), Section 5.10.15, for information regarding impact to receivers adjacent to Euston Road and Chapter 9 (Air Quality), Section 5.9.7 for information regarding general air quality concerns during operation.

5.14.12 Construction impacts on business

301 submitters raised issues regarding impacts on businesses during construction.

Issue description – impacts on businesses during construction

Submissions raised concerns that local businesses would be affected by road closures, and hence reduced patronage, during construction of the project. Specific areas of concern included Newtown, Alexandria and Florence Street at St Peters.

Response

Impacts on businesses during construction, including impacts on passing trade, have been assessed in the social and economic impact assessment in Chapter 15 and in Appendix M (Technical working paper: Social and economic) of the EIS. Changes in access arrangements have the potential to impact businesses by isolating them from customers or delivery/pick-up activities required for business operation. There is the potential for business turnover and employment to be impacted where business activities are temporarily impeded due to reduced access.

During the construction of the project, the local economy may experience a boost due to construction expenditure in the region. It is estimated that construction expenditure would directly and indirectly contribute an estimated $1.8 billion of output, $400 million of household income, around 4390 FTE jobs and $670 million in value added to the NSW economy on average per year of construction.

Economic benefits associated with the project would support the ongoing or improved economic vitality of the local area, which is valued by the community and local government.

Potential flow on effects of this increased economic activity could include increased employment opportunities in the region. The increase in demand for labour may also increase wages in the region, particularly for construction workers, who would be in high demand.

Issue description – assessment of businesses impacted during construction

Submissions raised concerns about the assessment of impacts to businesses including the following:

- Businesses such as those within then Garema Circuit Business Park were excluded from the EIS
- There is no construction schedule or traffic modelling to identify the impacts of construction on local areas.

Response

Business parks including the business park along Garema Circuit were considered in the social and economic impact assessment in Chapter 15 and Appendix M (Technical working paper: Social and economic) of the EIS. The assessment included the Garema Circuit Business Park as part of the Kingsgrove cluster of commercial and wholesaling retailers to the north of the M5 East Motorway.

The Garema Circuit Business Park is located to the east of Kingsgrove North construction compound (C1). As the majority of businesses in close proximity to construction compounds are industrial and commercial businesses, those business activities are not considered to be dependent on amenity, the impact of noise, vibration, air quality and visual amenity would be limited. Amenity impacts during the construction of the project are discussed in detail in Chapter 12 (Noise and vibration), Chapter 10 (Air quality) and Chapter 14 (Landscape character and visual impact) of the EIS

An indicative construction schedule is included in Chapter 6 of the EIS.

Traffic modelling has been undertaken for the New M5 as well as the full WestConnex program of works. A description of the traffic modelling developed for the project is included Chapter 9 of the EIS.

5.14.13 Operational impacts on businesses

2,488 submitters raised issues regarding impacts on businesses during operation.

Issue description – impacts on businesses along King Street at Newtown

Submissions raised concerns that the project would impact businesses along King Street in Newtown and therefore local tourism. Specific concerns included the following:

- The St Peters interchange would increase traffic congestion
- Car parking is already difficult and would significantly worsen with the project
- 24 hour clearways on King Street and impact on car parking
- Project may cause businesses to close
- Concern King Street would turn into a highway, impacting business
- Shoppers would not be able to navigate the narrow pavements
- Increased traffic
- Loss of employment resulting from impacts on businesses.

Response

The Technical working paper: Social and economic (refer to Appendix M of the EIS) concluded that the project would not have a significant impact on businesses or amenity along King Street. This conclusion was made on the basis that there would be no significant changes to traffic volumes, and no modifications to King Street as part of the project.

Submissions have indicated that the primary basis for concern regarding impacts on businesses along King Street in Newtown relates to an increase in the number of vehicles using King Street as a result of the St Peters interchange. To assess the potential impacts of traffic generated by the project on King Street, traffic modelling was undertaken to forecast predicted AM peak and PM peak traffic volumes under six scenarios:

1. Existing case (2012): Current road network with no new projects or upgrades
2. Operation 'do minimum' or 'without project' (2021): The 'do minimum' case assumes that the King Georges Road Interchange Upgrade and the M4 Widening are complete, but the remainder of the WestConnex projects are not built. It is called 'do minimum' rather than 'do nothing' as it assumes that ongoing improvements would be made to the broader transport network including some new infrastructure and intersection improvements to improve capacity and cater for traffic growth
3. With project (2021): The New M5 Motorway is complete and open to traffic, including the King Georges Road Interchange Upgrade and the M4 Widening, but without any other WestConnex projects
4. Operation 'do minimum' or 'without project' (2031): A future network that includes the King Georges Road Interchange Upgrade, the M4 Widening and some upgrades to the broader transport network over time to improve capacity and cater for traffic growth, but does not include the other WestConnex projects
5. With project (2031): The New M5 Motorway complete and open to traffic, including the King Georges Road Interchange Upgrade and the M4 Widening, but without any other WestConnex projects
6. Full WestConnex program of works and the Southern Connector (previously referred to in the EIS as the Southern extension) (2031): With all WestConnex projects completed, including the future M4–M5 Link and future Sydney Gateway, as well as the Southern Connector. In this scenario, the future M4–M5 Link does not provide an access to the CBD north. Due to capacity constraints on the Anzac Bridge and Harbour Bridge the provision of this connection is not possible without an additional Harbour crossing. At present the provision of an additional crossing is not a committed government scheme and as such neither the crossing nor the CBD north access at Rozelle has been included in the assessment.

A full description of this assessment methodology is provided in Section 9.1 of the EIS.

The EIS assessed the changes in peak hour traffic volumes on traffic routes in the vicinity of King Street in 2021 with the project, and in 2031 with the full WestConnex program of works and the future Southern Connector. These volumes are compared with the 'without project' scenario for both years.

Compared to the 2021 'without project' scenario, the 2021 'with project' scenario indicates similar or slightly reduced traffic volumes along King Street (south of Alice Street) in the AM and PM peak periods.

The 2031 'full WestConnex program of works and the future Southern Connector' scenario forecasts similar or reduced traffic flows along King Street northbound and increased flows along King Street southbound in both the AM and PM peak periods compared to the 2031 'without project' scenario.

The most significant forecast change in traffic volumes along the section of King Street south of Alice Street is under the 2031 'full WestConnex program of works and the future Southern Connector' scenario, where AM peak hour volumes southbound would increase by around 280 vehicles per hour when compared to the 'without project' scenario. However, vehicles traveling southbound in the AM peak period would be traveling against the dominant AM peak hour traffic flow and would be within the design capacity of the road.

Further, under the 2031 scenarios, vehicles traveling along King Street in the dominant direction during the AM peak hour (northbound) would experience a reduction of around 230 vehicles per hour under the 'full WestConnex program of works and the future Southern Connector' scenario when compared to the 2031 'without project' scenario.

Although the cumulative operation of the full WestConnex program of works would increase traffic demand, the additional capacity within the road network provided by these projects would effectively distribute and accommodate the predicted increases in traffic. As a result, there would be a cumulative benefit of the projects, resulting in significant increases in travel speeds through the local road network, and a reduction in average travel times. This benefit is in accordance with the aspirations of the local community (described in Chapter 4 of the EIS) and it is anticipated to deliver a positive impact on the local community's sense of connectedness and community cohesion.

Roads and Maritime is committed to development and implementation of the King Street Gateway in consultation with relevant local councils (refer to **Chapter 2** of this report), which may include re-design of the intersection of King Street and Sydney Park Road.

Issue description – Euston Road business impacts

Submissions have raised concerns that the project would impact on businesses along Euston Road.

Response

Impacts of permanent acquisition

The project would directly affect two businesses along Euston Road through permanent acquisition. These businesses would be subject to acquisition in accordance with the Roads and Maritime's *Land acquisition information guide* (Roads and Maritime Services, 2014) and the *Land Acquisition (Just Terms Compensation) Act 1991*. Due to the industrial and commercial 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 this land acquisition.

Changes in amenity and accessibility

The project has the potential to indirectly impact on businesses as along Euston Road through changes to amenity and accessibility. As the majority of businesses along Euston Road are industrial and commercial, the impacts on noise, vibration, air quality and visual amenity are limited. These businesses are not considered sensitive receivers as their business activities are not dependent on amenity. In addition, the activities and working environments of these business types are generally characterised by low amenity, and as such, impacts on employees are expected to be marginal.

A number of cafes and food venders are located within these industrial parks, close to the project. As these businesses generally serve the local workforce, it is not anticipated that amenity would influence customers' decisions to shop at these businesses.

Due to the change in the road layouts for the construction and operation of the St Peters interchange and the local road upgrade works, some properties along Euston Road would have temporary modifications to driveways as part of construction works and road widening. Access to properties not acquired for the project would be maintained during construction.

Changes to on-street parking

On-street parking along Campbell Road and Euston Road would be removed during construction. Given the limited number of residential properties in this vicinity and the proposed changes to land use as a result of the project, it is anticipated that demand for on-street parking would reduce. Therefore, the impact of reduced on-street parking is not anticipated to be significant. Works along Euston Road may displace car parking practices of commercial and industrial businesses located along this road. However, these businesses currently have on-site parking and the acquisition of industrial and commercial properties for the interchange may reduce overall demand.

During detailed design, lane widths and the potential removal of the central turning lane on Euston Road would be reviewed with an aim to reducing the road width.

Issue description – general concerns about impacts on businesses during operation

Submissions raised general concerns that the project would affect business in various surrounding suburbs, including Newtown (Erskineville Road, Enmore Road), Alexandria (McEvoy Street, Mitchell Road), St Peters, and Kingsgrove for a number of reasons including:

- reduced parking availability (including on street parking)
- proposed parking off main roads would encourage parking in Alexandria / Newtown
- increased Traffic
- clearways
- noise
- pollution
- turning the streets into highways
- impacts on main shopping streets
- gridlocked traffic would make it harder to stop and shop at these businesses
- additional traffic would not have a positive impact on local businesses
- road upgrading would impact Lonsdale, Farmer Joe's Chickens, Cue Clothing Company and Town and Country Pub which would not be able to continue at their current sites
- adverse pedestrian safety and amenity impacts would increase reliance on off-street parking which would see a loss of patronage and impact future commercial viability.

Response

Impacts from operation of the project on surrounding businesses including impacts on business amenity (noise, and pollution) and accessibility (traffic, parking) have been assessed in Section 15.3.2 and Appendix M (Technical working paper: Social and economic) of the EIS. The EIS demonstrated that these impacts would be temporary and could be managed within acceptable limits with the implementation of environmental management measures (refer to Chapter 8 of this document for revised environmental management measures).

Businesses located along the Princes Highway between the M5 East Motorway and the St Peters interchange, where traffic levels are anticipated to decrease due to the project may experience improved amenity due to reduced traffic levels. Improved amenity and accessibility due to the project may facilitate urban renewal of this area, attracting businesses that would benefit from improved amenity.

Operation of the project is estimated to contribute a total of $44 million in output, around $10 million in household income, 116 full-time equivalent jobs and $18 million in value added to the NSW economy per year of operation.

As a significant volume of traffic currently using the Princes Highway would be diverted into the New M5 tunnels, businesses in this location that are reliant on passing trade may be affected by the project. It has been estimated that there could be an annual reduction of around $0.4 million in output and around two fulltime equivalent jobs lost due to a loss in passing trade. This equates to a loss of 2.5 percent of total output and full-time equivalent employment for businesses reliant on passing trade. However, reductions in passing trade would potentially be offset to some degree by improved amenity and accessibility for the businesses affected.

Changes to parking are not anticipated to have a significant impact on business activity, as most businesses within the area can accommodate off-street parking. Additional on-street and off-street parking provided on Campbell Street and Venice Street as part of the project would help to alleviate impacts associated with removal of parking in other nearby areas. Off-peak on street parking on Euston Road would be reinstated upon completion of construction. The project has the ability to connect residential communities with locations of employment as a result of reduced congestion and shorter travel times. The project would also provide increased road capacity along the M5 Motorway corridor, which would indirectly benefit movement of freight between Sydney Airport and Port Botany,

and the western and south-western suburbs of Sydney and commercial vehicle movements between major centres. This benefit is in line with community aspirations and is anticipated to have a positive impact on the local community's sense of connectedness and community cohesion.

Access to two businesses would be permanently modified due to the project. Bunnings Mascot would have its access permanently modified to be via Bourke Road to accommodate the widening of Bourke Road and Gardeners Road. It is not anticipated that this change in access would have any impacts on the viability or operation of this business.

A distribution facility at Gardeners Road would also have altered access due to the construction of the Gardeners Road and Campbell Road bridges. This would result in a reduction in access currently afforded to the businesses contained within the facility. However, existing roads, including Campbell Road / Street, Princes Highway and Canal Road would provide opportunities for vehicles departing the facility to travel east. The project, as described in the EIS (Table 5-5), included the provision of a new T-intersection at the junction of the Campbell Road extension and the Southend Distribution Centre access road. To increase crossing opportunities for pedestrians along Campbell Road, this intersection would now be signalised. Signalisation would also continue to service the access and egress for the distribution centre. The intersection as amended by the Preferred Infrastructure Report is shown in Figure 7 6.

An additional property on Gardeners Road, near the Bourke Street / Road intersection may also require the provision of an additional access point due to strip acquisition.

Issue description – adequacy of assessment of impact of businesses during operation

Submissions have raised concerns regarding the adequacy of the assessment on impact to business during operation. The following specific issues were raised:

- Details of permanent impacts on business access and on-street parking, due to a change in road layout as part of the St Peters interchange have not been discussed
- Alexandria businesses are not included in the economic impact statement
- Overall economic effects of project are left ambiguous and unclear. The EIS states that the project delivers benefits in the form of increased local expenditure, but acknowledges that access arrangements would negatively affect local business.

Response

The social and economic impact assessment presented in Appendix M (Technical working paper: Social and economic) of the EIS has been prepared in accordance with the SEARs, the relevant provisions of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* and the *Environmental Impact Assessment Practice Note: Socio-economic assessment* (Roads and Maritime, 2013b). The assessment includes a balanced consideration of both the potential positive and negative impacts on community identity and social connections.

Impacts as a result of changes to accessibility and parking are discussed in Chapter 15 and Appendix M of the EIS. Section 3.2.2 in Appendix M (Technical working paper: Social and economic) identifies businesses that were considered in the social and economic impact. The study area for the assessment included the following Local Government Areas (LGAs):

- Canterbury
- Hurstville
- Rockdale
- Marrickville
- Botany Bay
- Sydney.

Businesses within the study area including businesses in Alexandria were assessed in the social and economic assessment.

Increased expenditure from locally made purchases would predominantly occur during the construction period as local businesses benefit from purchases made by construction businesses and associated workers to build and support the development of the project. Businesses that may directly benefit from construction of the project would include local contractors and businesses which service or supply goods to the construction industry such as food and beverage retailers, accommodation providers, and other retail outlets that would cater to the day to-day needs of the construction workforce.

While certain types of businesses would see benefits associated with construction of the project, other business types may experience impacts from changes to access. The construction and operation of the St Peters interchange and the local road upgrade works would require temporary modifications to the driveways of some properties along Euston Road and Gardeners Road.

The majority of the businesses along Euston Road require both heavy and light vehicle access for delivery and / or pick-up activities. There is the potential for business turnover and employment to be impacted where business activities are temporarily impeded due to reduced access. A number of businesses on Euston Road have existing alternative access from Burrows Road. Impacts to access would be managed in consultation with affected property owners.

During operation, access to two businesses would be permanently modified due to the project. Bunnings Mascot would have its access permanently modified to be via Bourke Road to accommodate the widening of Bourke Road and Gardeners Road. It is not anticipated that this change in access would have any impacts on the viability or operation of the business.

A distribution facility at Gardeners Road would also have altered access due to the construction of the Gardeners Road and Campbell Road bridges. This would result in a reduction in access currently afforded to the businesses contained within the facility. However, existing roads, including Campbell Road / Street, Princes Highway and Canal Road would provide opportunities for vehicles departing the facility to travel east.

An additional property on Gardeners Road, near the Bourke Street / Road intersection may also require the provision of an additional access point due to strip acquisition.

Changes to parking are not anticipated to have a significant impact on business activity, as most businesses within the area can accommodate off-street parking. Additional on-street and off-street parking provided on Campbell Street and Venice Street as part of the project would help to alleviate impacts associated with removal of parking in other nearby areas. Off-peak on street parking on Euston Road would be reinstated upon completion of construction.

Issue description – impacts on Garema Circuit Business Park

Submissions raised concern that the Garema Circuit Business Park would be negatively affected during operation by disruptions to commuting and deliveries, and delivery delays to economic improvement plans that are intended to improve access to the area from Kingsgrove Road and increase utilisation of floor space for the LGA.

Response

The project would utilise Garema Circuit as an access route to and from the Kingsgrove North construction compound (C1) during construction. Following construction, the properties zoned as IN2 Light Industry acquired for the project would be made available for redevelopment. There would be no direct access to and from Garema Circuit from the operational New M5. As such, the project is not anticipated to have a significant impact on commuting and delivery times for businesses located within Garema Circuit.

The project would improve the connection of businesses on Garema Circuit to the broader network by improving network efficiency, delivering travel time savings and providing more efficient movement of freight and commercial vehicles. The New M5 would improve the capacity of the NSW motorway network, particularly along the M5 Motorway corridor, and would support connections to Sydney

Airport and Port Botany, assisting with freight movements. The project would also provide increased road capacity for commercial vehicle movements between major centres.

5.15 Soil and water quality

5.15.1 Construction erosion and sedimentation

No issues raised in community submissions were categorised under 'construction erosion and sedimentation'.

5.15.2 Construction water quality and discharge

No issues raised in community submissions were categorised under 'construction water quality and discharge'.

5.15.3 Operational drainage infrastructure

No issues raised in community submissions were categorised under 'operational drainage infrastructure'.

5.15.4 Operational water quality, treatment and discharge

Nine submitters have raised issues regarding water quality, water discharges and the treatment of water during operation.

Issue description – waterway pollution from road runoff

Submissions have raised concern that water runoff from operation of the road would contaminate and pollute waterways.

Response

Although the project would result in an increase in impervious surface areas, the project overall would result in less pollutants being delivered to local watercourses and to Botany Bay.

The operational water quality impacts from the aboveground permanent infrastructure associated with the project are assessed in Section 16.3.2 of the EIS. These impacts would be caused mostly by an increase in runoff from increased of impervious areas and the related mobilisation of pollutants from the road carriageway. However, surface water management measures to be maintained or installed as part of the project are sufficient to meet or exceed minimum treatment targets in affected catchments, such that the project overall would result in less pollutants being delivered to Botany Bay.

Pollutant loads generated by surface runoff would be managed through a range of stormwater treatment measures such as gross pollutant traps, constructed wetlands, bioretention systems, water quality basins and proprietary treatment devices.

Section 16.4 of the EIS (as amended by **Chapter 8** (Revised environmental management measures) of this report) outlines the measures that would be applied to mitigate potential water quality impacts during operation. In particular, widened carriageways and connections to existing roads, and the local road upgrades around the St Peters interchange would require the management of additional surface water runoff. The following management measures would be implemented:

- Suitable stormwater treatment devices would be defined during detailed design, with the aim of meeting the targets of the Botany Bay and Catchment Water Quality Improvement Plan (SMCMA, 2011). Where space is available, surface water detention basins would be installed. Where space is limited, treatment would include the use of proprietary stormwater treatment devices. The design of treatment systems would be informed by the assessment of the sensitivity of the receiving environments and supported by model for urban stormwater improvement conceptualisation (MUSIC) modelling
- New discharge outlets into the Alexandra Canal would be designed with sufficient energy dissipation or scour protection to limit the disturbance or resuspension of contaminated sediments

- Where space is available, drainage and discharge infrastructure would incorporate appropriate measures to trap and remove sediments to meet the stormwater pollution reduction targets of the Botany Bay and Catchment Water Quality Improvement Plan (SMCMA, 2011). This would also reduce the risk of impacts on the geomorphic condition of receiving waters.

Operational water quality monitoring would be conducted for 12 months post-construction or as otherwise required by the conditions of approval. This would include upstream (control) and downstream monitoring locations. The details of this monitoring program would be contained in the Soil and Water Management Plan, and would include the following:

- Sampling locations to include upstream (control) and downstream measurement locations
- Samples taken twice a month, once in dry conditions and once in wet conditions where possible
- In-situ monitoring of:
  - pH
  - Reduction oxidation potential
  - Dissolved oxygen
  - Temperature
  - Conductivity
  - Turbidity
  - Colour
  - Odour
- Analytical sampling of the following potential constituents of concern:
  - Total recoverable hydrocarbons
  - Benzene, toluene, ethylbenzene, xylene and naphthalene
  - Nutrients including: total nitrogen, total Kjeldahl nitrogen, nitrogen oxide, nitrite, nitrate, total phosphorous and reactive phosphorous
  - Heavy metals (arsenic, cadmium, copper, chromium, lead, mercury, nickel, zinc)
  - Manganese
  - Ferrous iron and total iron.

Issue description – impacts on Sydney Park stormwater harvesting ponds

Submissions expressed concern that the project would impact the Sydney Park stormwater harvesting ponds.

Response

Direct impacts and stormwater flows from existing infrastructure to the Sydney Park stormwater harvesting ponds would not occur as a result of construction or operation of the project.

Indirect impacts on the Sydney Park stormwater harvesting ponds would also be unlikely because:

- The wetlands themselves within Sydney Park are outside of the project footprint, and consequently, would not be affected by the project.
- Most of the harvested stormwater is taken from the Munni Channel. Construction of the project would impact only a very small proportion of the Munni Channel catchment through local road upgrades.

Sydney Park forms the local catchment for the Sydney Park stormwater harvesting ponds. Small sections of Sydney Park would be impacted by the Sydney Park construction compound (C14) (0.55 hectares) and local road upgrades (0.2 hectares). Around 146 square metres of Sydney Water land adjacent to the road reserve within Sydney Park would also be acquired.

Impacts to the wetlands are unlikely as the Sydney Park areas impacted by the project are small in extent and management would be subject to erosion and sediment controls through the Soil and Water Management Plan prepared as part of the overall Construction Environmental Management Plan (CEMP). Soil and Water Management Plan details are provided in Table 16-14 of the EIS (as amended in **Chapter 8** of this report). In most cases there is also a wide landscape buffer between the works and the wetlands.

The Sydney Park construction compound site would be rehabilitated at the completion of construction, with the exception of the areas of land required permanently for the footprint of the bridge and pedestrian and cycle paths.

5.16 Contamination

5.16.1 Assessment methods

1,279 submitters have raised issues regarding contamination assessment methods.

Issue description – asbestos contamination assessment

Submissions have raised concerns regarding the accuracy of the asbestos contamination assessment at the former Alexandria Landfill site.

Response

The assessment of contamination issues, including asbestos, at the Alexandria Landfill site presented in Chapter 17 and Appendix O (Technical working paper: Contamination) of the EIS has been carried out to address the SEARs for the project and with consideration of the following guidance documents:

- Contaminated Sites, Sampling Design Guidelines (NSW EPA, 1995)
- Contaminated Sites, Guidelines for the Site Auditor Scheme (2nd Edition) (DEC, 2006)
- Contaminated Sites, Guidelines for Consultants Reporting on Contaminated Sites (OEH, 2011)
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (revised) (NEPC, 2013).

The detailed Phase 2 Environmental Site Assessment (ESA) report referenced in the EIS, which included the assessment of asbestos, has been reviewed by a NSW EPA accredited Site Auditor. The Site Auditor has confirmed the quality and suitability of the contamination assessment for the purpose of the EIS and preparation of the Landfill Closure Management Plan (LCMP).

Issue description – sulphate testing method

A submission raised an issue regarding the sulfate testing method used for quantifying phenol containing compounds. The submission stated that the assessment appeared to under represent many compounds like pentachlorophenol (sulfate by discrete analyser method).

Response

Sample analysis was completed by a NATA-accredited laboratory in general accordance with the Schedule B3 of *National Environment Protection (Assessment of Site Contamination) Measure 1999 (revised)* (NEPC, 2013).

The analytical methods adopted during the investigation program of works are industry standard and considered appropriate for the purposes of the investigations completed. A quality assurance and quality control assessment of the analytical data was undertaken as part of the reporting process, which was independently reviewed by third party reviewers including a NSW EPA accredited Site Auditor who was specifically engaged to review the information obtained as part of the site investigation.

Issue description – landfill gas generation rates

A submission stated that the assumption that food waste was removed from the waste stream in the estimation of landfill gas generation rates was flawed, given the types of gases present and the ammonia level in the landfill leachate. The submission queried the qualifications of the team that

made these assumptions, and sought clarification as to whether this will require that a new landfill EIS be developed.

Response

The Alexandria Landfill is currently and has been historically licensed by the NSW EPA as a non-putrescible landfill, which precludes receiving and landfilling of food waste. The landfill has however, been licensed to accept wood waste in the past. The composition and concentrations of contaminants in the leachate and landfill gas are considered to be consistent with the types of wastes the landfill has been licensed to receive. The investigations and assessment were carried out by appropriately qualified technical specialists.

Preliminary landfill gas generation rates have been calculated and modelled based on the outcomes of the site investigation works, which included landfill gas and leachate monitoring data. These calculations have been made to assist with identifying appropriate methodologies for future management during the landfill closure phase. The assumptions for the landfill gas generation estimates are considered appropriate based on the information obtained as part of the site investigation process.

Issue description – ionic balance

A submission stated that section 4 of EPA's Landfill Guidelines specify that the ionic balance should be ± 5 per cent, however it was found to be up to 10 per cent during the assessment. The submission asserted that this indicates poor quality assurance framework and lack of expertise.

Response

The reported ionic balance ranged between 0.72 per cent and 10.2 per cent with a mean of 4.6 per cent which is below the indicative 5 per cent value mentioned in the *Draft Environmental Guidelines: Solid Waste Landfills* (EPA, 2015). The site investigation works completed at Alexandria Landfill have been subject to review by a NSW EPA accredited Site Auditor, consistent with good practice and reflective of a good quality assurance framework. The Site Auditor has endorsed the site investigation works as having been completed in accordance with the requirements if the relevant EPA guidelines and being appropriate to be used for the development of the Landfill Closure Management Plan (LCMP).

Issue description – assessment of total phenolic containing compounds

A submission expressed concern that the EIS does not provide details of the specific methods undertaken to assess total phenolic containing compounds, on the basis that the submission asserted that phenol containing compounds have highly varied toxicities and it is important to know which compound is present.

Response

The EIS presents information from a large number of specialist reports, and does not duplicate all of the information in those specialist reports where such information is not material to the environmental impact assessment. Detailed technical data including specific laboratory methods for phenolic containing compounds are presented separately in:

- Phase 2 Environmental Site Assessment, Alexandria Landfill, 10 – 16 Albert Street, St Peters, NSW (AECOM, 2015)
- Phase 2 Environmental Site Assessment, 5 and 5A Canal Road, St Peters, NSW (AECOM, 2015).

Contamination reports were reviewed by a NSW EPA accredited Site Auditor to confirm the adequacy of the reported information.

Issue description – polycyclic aromatic hydrocarbons

A submission noted that using total recoverable hydrocarbons analysis, the EIS identified polycyclic aromatic hydrocarbons (PAH's) as one of the contaminants of concern. The submission suggested that it is unlikely that naphthalene was the only PAH detected in the leachate, and sought clarification as to whether there were other PAH's tested and identified.

Response

Sixteen priority PAH compounds were tested in landfill leachate samples collected as part of the site investigation works. Reported results were less than the laboratory limit of reporting (LOR), with the exception of one total PAH result which was reported at the laboratory LOR.

Issue description – sulfate testing method not EPA approved

A submission stated that the sulfate testing method used in the assessment described in the EIS is not on the NSW EPA's list of approved methods.

Response

The laboratory method used to assess sulfate concentrations is compliant with Schedule B(3) (Guideline on Laboratory Analysis of Contaminated Soils) of the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC 2013), and has been accepted by the NSW EPA.

The analytical methods referred to in the submission related to EPL conditions outlined in Section M3 of EPL licence 4627. The site investigation works conducted as part of the landfill investigation were not undertaken for EPL compliance purposes but as part of an intrusive investigation scope of works. The analytical methods for these works require compliance with the NEPM.

Issue description – vinyl chloride levels

A submission stated that the omission of testing and reporting on volatile halocarbons was an oversight, having regarding to the high vinyl chloride levels (up to 485ppb in gas). Since this compound was found at relatively high concentrations in the gas, it is likely that it will be detectable in the ground water and should be tested.

Response

Groundwater was analysed for the presence of vinyl chloride among a suite of other analytes. Concentrations of vinyl chloride were not detected in groundwater above the laboratory limit of reporting and were below the adopted groundwater assessment criteria.

Issue description – leachate modelling

A submission noted that the assessment did not provide real leachate modelling in accordance with Section 2.3 of the Landfill Guidelines.

Response

A water balance was undertaken for leachate generation at Alexandria Landfill to assess the necessary capacity for the project's water treatment plant to be constructed. The water balance was also used to calculate the reduction in leachate generation that will result from the construction of a groundwater cut-off wall to reduce the inflow from the Botany Sands aquifer into the landfill.

The water balance and associated calculations are included in *Alexandria Landfill Closure – Hydrogeological Assessment* (AECOM, 2015).

Issue Description – leachate management

Concerns were raised regarding the management of leachate from the Alexandria Landfill site. The EIS does not specify the intended management of leachate following the cancellation of Sydney Water's discharge licence. Furthermore, it is unclear why Sydney Water has not requested the installation of nitrification cell filtering.

Response

Alexandria Landfill was acquired by the NSW Government in December 2014, and operated as a non-putrescible solid waste landfill and recycling centre under Environmental Protection Licences (EPLs) issued by the NSW EPA. Activities consistent with the existing planning approvals and EPLs are continuing, however the site no longer operates commercially as a landfill.

Leachate generated by the landfill is collected via a leachate collection system, which is then directed to an on-site Leachate Treatment Plant (LTP) prior to discharge to sewer. Treated leachate is discharged to sewer in accordance with a trade waste agreement with Sydney Water.

Since acquiring the site, Roads and Maritime has entered into an effluent improvement program with Sydney Water to upgrade the LTP to a standard that can treat collected leachate to concentrations compliant with the requirements of the trade waste agreement. The effluent improvement program has been completed and the LTP now reliably treats leachate, particularly ammonia, to concentrations suitable for sewer discharge.

The current LTP is to be maintained during landfill closure works and construction of the St Peters interchange, until such time as the revised leachate management strategy, to be implemented as part of the New M5 project, is adopted. Discharge of treated leachate to sewer will continue in accordance with the needs of the continued operations of the landfill infrastructure, as required by the landfill closure management plan.

Issue Description – water quality testing and modelling

Submissions have raised concern that the strategy for water modelling was not adequately assessed. Concerns included; water modelling undertaken as part of the EIS did not incorporate leachate modelling (i.e. water balance modelling), despite it being identified as a necessary requirement in Section 2.3 of the Draft Environmental Guidelines: Solid Waste Landfills (EPA, 2015).

Response

A water balance was undertaken for leachate generation at Alexandria Landfill to assess the necessary capacity for the project's water treatment plant to be constructed. The water balance was also used to calculate the reduction in leachate generation that would result from the construction of a groundwater cut-off wall to reduce the inflow from the Botany Sands aquifer into the landfill.

The water balance and associated calculations are included in *Alexandria Landfill Closure – Hydrogeological Assessment* (AECOM, 2015).

5.16.2 General impacts on contaminated land

2,255 submitters have raised issues impacts of the project on contaminated land.

Issue description – asbestos management at St Peters

Submissions have raised concerns regarding the management and remediation of asbestos at the Alexandria Landfill site. The following was of particular concern:

- Removal techniques are unsafe and will impact upon the health of the community
- A lack of confidence in the proponent's capacity to safely and adequately manage asbestos contamination.

Response

In November 2014, the NSW Government announced the New M5 St Peters interchange will be mainly built on the site of the Alexandria Landfill, a licensed solid waste and asbestos waste landfill. Since acquisition, works have been undertaken at the premises to upgrade the landfill infrastructure and operations to a standard compliant with requirements of the environmental protection licence conditions that are regulated by the NSW EPA. This includes the removal of non-compliant materials, including a stockpile of asbestos waste located within the recycling premises.

Management of asbestos waste contained within Stockpile 21, which is subject to a clean-up notice initially issued to the former landfill operators on this site, is continuing in consultation and to the satisfaction of the NSW EPA. All clean-up activities are being carried out in accordance with the:

- NSW Work Health and Safety Act 2011
- Safe Work Australia Code of Practice 'How to manage and control asbestos in the workplace'
- Safe Work Australia Code of Practice 'How to safely remove asbestos'.

Asbestos clean-up works are being undertaken in a manner which is protective of the health of the surrounding community. Clean-up activities on the site, including the ongoing removal of asbestos, are being carried out in accordance with existing development consents and Environment Protection Licences.

Prior to opening of the project, landfill closure works would be completed to rehabilitate the land and mitigate long-term risks associated with the landfilled waste. A Landfill Closure Management Plan (LCMP) has been prepared in consultation with the NSW EPA, which has endorsed the proposed approach and strategy, including the management of asbestos waste.

A final LCMP will be prepared for implementation as part of the detailed design, based on the fundamental scope, strategy and specifications of the EPA endorsed LCMP.

Issue description – community impacts from disturbance of contaminated land

Submissions have raised concern that the community may be impacted by toxic materials originating from disturbed contaminated lands.

Response

Alexandria Landfill has operated as a solid waste and asbestos waste landfill since the late 1980s. As required by the *Protection of the Environment Operations Act 1997* and applicable regulations, landfill closure works are required following completion of landfill activities to rehabilitate the land and to mitigate long-term risks associated with landfill wastes.

A Landfill Closure Management Plan (LCMP) has been prepared in consultation with the NSW EPA, which has endorsed the closure approach and strategy. A final LCMP would be prepared for implementation as part of detailed design, based on the fundamental scope, strategy and specifications of the EPA-endorsed LCMP.

A Construction Environmental Management Plan (CEMP) would also be prepared to outline the management controls and operations monitoring that would be put in place to mitigate risks to the environment and local community.

Issue description – EPA clean up notice

Submissions have raised questions regarding the EPA clean-up notice that was issued to Roads and Maritime on the 6 of November 2015 (Licence 12594), specifically:

- Why was this not mentioned in the EIS
- The costs of the clean-up were over budget
- What are the results of the compulsory sampling, testing and monitoring of asbestos waste
- Results of the air quality monitoring for airborne asbestos (associated with Stockpile 21) should be publicly released
- What evidence is there that access security measures were adhered to when monitoring works of Stockpile 21 were being executed?

Response

Activities being carried out to comply with the requirements of the clean-up notice issued by the EPA are separate to the New M5 project. The clean-up notice does not materially affect the assessment presented in the EIS for the project.

As required by the clean-up notice, reports detailing the progress of the clean-up action, including sampling and environmental results, have been provided to the EPA.

Compliance with the clean-up notice is required by 6 May 2016, which includes the submission of a report to the EPA that outlines a plan of management for any residual materials. In agreement with the EPA, the management of any residual materials would be integrated into the overall landfill closure works required for Alexandria Landfill.

Issue description – presence of ammonia at Alexandria Landfill

Submissions have expressed concern that the presence of ammonia at the landfill site suggests the waste is significantly putrescible and not inert, therefore the management of the site as currently prescribed may not meet requirements pertaining to putrescible content.

Response

The Alexandria Landfill is currently and has been historically licensed by the NSW EPA as a non-putrescible landfill. The landfill has never been licensed to receive putrescible waste. The landfill has however, been licensed to accept wood waste in the past. The composition and concentrations of contaminants in the leachate and landfill gas are considered to be consistent with the types of wastes the landfill has been licensed to receive.

The management strategy for the site has been developed based on data obtained during the site investigation process, including consideration of ammonia concentrations in leachate. This approach has been undertaken to ensure that the landfill is being appropriately managed in accordance with actual site conditions and takes into consideration compliance requirements for the ongoing management of the former landfill, including the management of leachate during the landfill closure phase of works.

Issue description – capping of the Alexandria Landfill

Submissions have raised concern regarding the adequacy of landfill capping measures in place for the Alexandria Landfill site. In particular:

- The clay (low permeability) layer is of insufficient thickness
- There is a lack of a high density polyethylene or linear low density polyethylene liner under the clay.
- The covering vegetation layer is inadequate.

Response

The landfill capping layer has been developed in consultation with NSW EPA with reference to NSW EPA and other relevant guidance documentation, including:

- Draft Environmental Guidelines Solid Waste Landfills, Second Edition (NSW EPA, 2015).
- Environmental Guidelines: Solid Waste Landfills (NSW EPA, 1996).
- Draft Environmental Guidelines for Industrial Waste Landfills (NSW EPA, 1998).
- Closed Landfill Guidelines (VIC EPA, 2012).
- Siting, Design, Operation and Rehabilitation of Landfills (VIC EPA, 2014).

Based on the outcomes of detailed site investigation works completed across Alexandria Landfill, an initial Landfill Closure Management Plan (LCMP) has been prepared. The LCMP evaluates the site conditions and future land form to determine the design specification for the landfill capping layer.

All departures from the reference guidance have been in consultation with the EPA with consideration given to the requirements of the development of the former landfill as a motorway interchange (the St Peters interchange).

The LCMP has been reviewed and endorsed by both a NSW EPA-accredited Site Auditor (contaminated land) and EPA (waste) as an appropriate approach to mitigate long-term risks posed by the landfilled wastes and rehabilitating the land to a condition suitable for the St Peters Interchange.

Notwithstanding the above considerations:

- The clay layer is proposed to comprise a 500mm thick low permeability material layer with a permeability ranging between 10^{-6} m/s to 10^{-8} m/s which is considered adequate in the context of the overarching interchange design

- Given the nature of the proposed construction design, the inclusion of a HDPE or LDPE liner was not considered appropriate in the context of the development plans for the motorway interchange
- The vegetation layer comprises a nominal 500 millimetre thick top soil re-vegetation layer with localised thickening to accommodate taller vegetation (if required). Revegetation works will be undertaken with consideration of the vegetation layer thickness and will be undertaken in accordance with a site specific vegetation management plan developed for the site.

A final LCMP will be prepared for implementation as part of the detailed design, based on the fundamental scope, strategy and specifications of the EPA endorsed LCMP.

Issue description – Alexandria Landfill Closure Management Plan

A submission stated that the Landfill Closure Management Plan in the EIS is inadequate and will not meet the targets defined in the *Draft Environmental Guidelines Solid Waste Landfills, Second Edition* (EPA, 2015).

Additional submissions have stated that there is a lack of detail about the Alexandria Landfill closure and how groundwater would be protected.

Response

The Landfill Closure Management Plan (LCMP) has been developed having regard to relevant guidance and legislation, including the *Draft Environmental Guidelines Solid Waste Landfills. Second Edition* (EPA, 2015) and has been developed in accordance with the requirements of the *Protection of the Environment Operations Act 1997*.

The document was prepared taking into account development of the site as a motorway interchange with inputs from project stakeholders regarding engineering and design considerations. The LCMP was prepared following a thorough consultation and review process with inputs from landfill specialists, the Waste Assets Management Corporation (WAMC), the NSW EPA and a Site Auditor accredited under the *Contaminated Land Management Act 1997* (CLM Act). Based on the outcome of the review and consultation process, the document is considered adequate and appropriate for its intended purpose.

Details of groundwater protection measures at the landfill site are provided in Section 17.3.4 of the EIS. A groundwater quality monitoring program would be prepared and implemented to monitor groundwater impacts during tunnel activities and to outline management measures for groundwater inflows, treatment and discharge and protocols for spillages or incidents.

The program would be developed in consultation with the EPA, DPI (Fisheries), DPI Water and relevant local councils. Contingency measures to address leachate management in the event of pump failure would be explored during detailed design and implemented in the LCMP. The LCMP has been reviewed and endorsed by both a NSW EPA-accredited Site Auditor (contaminated land) and EPA (waste) as an appropriate approach to mitigate long-term risks posed by the landfilled wastes and rehabilitate the land to a condition suitable for the proposed motorway interchange.

5.16.3 Contamination of land due to the project

Five submitters have raised issues regarding contaminated lands arising from the project.

Issue description – relocation of asbestos containing soils

Submissions have raised concerns regarding the relocation of asbestos containing soils from the Alexandria Landfill to areas in the western suburbs and would like clarification as to how this would be managed and how it may impact affected communities.

Response

In November 2014, the NSW Government announced the New M5 St Peters interchange would be mainly constructed on the site of the Alexandria Landfill, a licensed solid waste and asbestos waste landfill. Since acquisition, works have been undertaken at the premises to upgrade the landfill infrastructure and operations to a standard compliant with requirements of the environmental protection licence conditions that are regulated by the NSW EPA. This includes the removal of non-compliant materials, including a stockpile of asbestos waste located within the recycling premises.

Management of asbestos waste contained within Stockpile 21, which is subject to a clean-up notice initially issued to the former landfill operators, is continuing in consultation and to the satisfaction of the NSW EPA. All clean-up activities are being carried out safely and in a manner protective of the health of the surrounding community. All clean-up activities on the site, including the ongoing removal of asbestos, are being carried out in accordance with existing development consents and Environment Protection Licences. These works would be completed prior to and during works for the New M5 project.

As part of the construction of St Peters interchange at the Alexandria Landfill site, landfill closure works are to be completed to rehabilitate the land and mitigate long-term risks associated with the presence of landfilled waste. This would include the management of asbestos wastes, most of which is designed to be encapsulated at the site beneath the landfill capping layer. A Landfill Closure Management Plan (LCMP) has been prepared in consultation with the NSW EPA, which has endorsed the proposed approach and strategy.

A final LCMP will be prepared for implementation as part of the detailed design, based on the fundamental scope, strategy and specifications of the EPA endorsed LCMP. As stated in Section 24.1.1 of the EIS, management and disposal of asbestos containing material would be undertaken in accordance with the following legislation, guidelines and standards:

- Work Health and Safety Act 2011 (NSW)
- Code of Practice for the Safe Removal of Asbestos 2nd Edition (National Occupational Health and Safety Commission (NOHSC) 2005a)
- Code of Practice for the Management and Control of Asbestos in Workplaces (NOHSC 2005b)
- Protection of the Environment Operations (Waste) Regulation 2005 – clause 42 special requirements relating to asbestos waste
- National Environment Protection (Assessment of Site Contamination) Measure 1999
- AS2601:2001 Demolition of Structures.

The project would comply with applicable standards and legislative requirements for the transport of hazardous and potentially hazardous materials. Haulage routes for the project, including roads to be used by vehicles carrying waste materials, have been identified.

5.17 Flooding and drainage

5.17.1 Construction hydrology and drainage

No issues raised in community submissions were categorised under ‘construction hydrology and drainage’.

5.17.2 Operational hydrology and drainage

821 submitters raised issues regarding hydrology and drainage during operation.

Issue description – impacts of project on flooding and drainage

Submissions expressed general concerns with the methodology used to assess the potential operational flooding and drainage impacts of the project. Submissions also raised general concerns that there would be unacceptable mainstream and localised flooding impacts and requested that flooding impacts be minimised during operation of the project.

Response

The flooding and drainage assessments for construction and operation of the project described in Section 18.3.1 and Section 18.3.2 of the EIS were conducted in line with the Secretary’s Environmental Assessment Requirements (SEARs) for the project and the requirements of the *Floodplain Development Manual* (Department of Infrastructure, Planning and Natural Resources, 2005), which incorporates the NSW Government’s *Flood Prone Land Policy* (Office of Environment and Heritage, 2005). These assessments comprised a thorough evaluation of localised and mainstream flooding impacts, and included:

- Identification of existing flood behaviour and drainage infrastructure
- Assessment of the potential impacts of the project on flooding during construction and operation
- Identification of appropriate management and safeguard measures to minimise and manage flooding impacts.

Both qualitative and quantitative assessments were undertaken within the Upper Wolli Creek floodplain, Lower Cooks River floodplain extent and Alexandra Canal floodplain. These extents are identified on Figure 18-1 to 18-3 of the EIS.

The 20 year average recurrence interval (ARI) flood and 100 year ARI flood were targeted in the flooding assessments because:

- The 20 year ARI flood provides a frequent flood event, and 20 year ARI flood is most relevant to construction given the duration and temporary nature of the construction works. The likelihood of a 100 year ARI event or a probable maximum flood occurring during the construction of the project is low
- The 100 year ARI flood is considered the standard planning reference for flooding during operation. The *Floodplain Development Manual* requires land use planning to consider the 100 year ARI flood for residential development (and by default commercial and industrial development).

The assessment of potential flooding and drainage impacts during construction is described in Section 18.3.1 of the EIS. The assessment found that there would be the potential for localised flood-related impacts during the construction phase, but that these would be relatively minor and would be effectively managed through the implementation of management measures detailed in Section 18.4 of the EIS (as revised in **Chapter 8** (Revised environmental management measures) of this report).

Section 18.3.2 of the EIS describes the potential flooding and drainage impacts during operation of the project. The assessment identified the potential for localised flood-related impacts during operation, but found that these would be adequately managed by both the existing drainage and surface water management infrastructure in most areas. Where sections of the existing drainage infrastructure would be affected by the project and / or would require relocation, additional upgrades of the existing infrastructure would be designed to manage potential flooding impacts.

The drainage structures incorporated into the project would include both existing drainage infrastructure around the interchanges, tie-in and integration works, and new operational ancillary facilities, designed to meet additional capacity requirements associated with increased impervious areas. Appropriate energy dissipation and scour protection would be provided downstream of relevant drainage infrastructure to prevent adverse impacts on bed and bank stability, and to protect the existing water quality of downstream watercourses. These drainage systems would be confirmed during the detailed designed phase and implemented to minimise potential impacts on receiving watercourses. The drainage systems that would form part of the project are detailed in Table 18-4 of the EIS.

Further details of the assessment of localised flooding impacts during construction and operation, and mainstream flooding impacts during construction are presented in the Technical working paper: Surface water (Appendix N of the EIS). The assessment of mainstream flooding impacts during operation is presented in Technical working paper: Flooding (Appendix P of the EIS).

As described in Section 18.4 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report), environmental management measures would include:

- Preparation of a Flood Management Strategy (FMS) would be undertaken by a suitably qualified and experienced person in consultation with directly affected landowners, Office of Environment and Heritage (OEH), Sydney Water and the relevant local councils. The FMS would include:
  - Identification of flood risks to the project and adjoining areas, including consideration of local drainage catchment assessments and climate change implications on rainfall and drainage characteristics
  - Design and management measures to protect proposed operations and not worsen existing flooding characteristics during construction and operation, including soil erosion and scouring

- Drainage system upgrades
- Relevant flooding information would be provided to relevant local councils and NSW State Emergency Services to help inform emergency management plans
- Preparation of a flood / emergency management plan.

- Management of adverse flood impacts through the FMS. This would include:
  - Development of detailed designs to mitigate the impacts of flooding, including designs of drainage infrastructure, road infrastructure, detention areas, and energy dissipation measures as appropriate
  - A detailed hydrologic and hydraulic assessment into flooding behaviour and management measures required during detailed design
  - Design of works within the floodplain to minimise adverse impacts on surrounding development for flooding up to the 100 year ARI event. Assessment would investigate impacts a 100 year ARI flood and the probable maximum flood, in the context of impacts on critical infrastructure and flood hazards
  - Contingency plans to manage flooding particularly for areas within the 20 year ARI flood event zone.

An updated assessment would be undertaken during detailed design to determine the climate change related flood risks to the project in accordance with environmental management measure FD18 as described in **Chapter 8** (Revised environmental management measures) of this report. The assessment would be undertaken in accordance with the *Practical Considerations of Climate Change – Floodplain Risk Management Guideline* (DECC, 2007).

Issue description – impacts along Campbell Street

Submissions raised concern about the potential for localised flooding and drainage impacts associated with the project around Campbell Street and Campbell Road at St Peters, including:

- Localised flooding as a result of the design of the upgrade works along Campbell Street, including the new median strip
- Concern that the assessment had not considered the potential localised flooding impacts along Lackey Street and Hutchinson Street at St Peters, particularly during storm events.

Response

The local road upgrades including those along Campbell Street / Campbell Road have been designed to incorporate additional drainage capacity requirements associated with increased impervious areas of the project, such as the new median strip on Campbell Street.

The flooding and drainage impact assessment at Section 18.3.2 of the EIS and in Section 6.2 and Section 7.2 of the Technical working paper: Surface water in Appendix N of the EIS considered the impacts of the realignment, widening (including the median strip) and extension along Campbell Street / Campbell Road in relation to both localised and mainstream flooding events. Both qualitative and quantitative assessments were undertaken within the Alexandra Canal floodplain. These extents are identified on Figure 18-6 of the EIS.

The assessment identified that the additional pavement areas from the widening of Campbell Street and adjoining streets may cause an increase in runoff within the catchment draining to Camdenville Park. Impacts on Campbell Street and Campbell Road would be managed by drainage upgrades.

A detailed survey and condition assessment of existing drainage infrastructure would be used to inform detailed design of tie-in works with new drainage infrastructure. This would include an investigation of potential transverse drainage upgrades to maximise drainage efficiency.

An investigation of overland flow paths impacted by the project would also be conducted during detailed design to confirm the extent of potential property related impacts. Where undesirable impacts are identified, potential management measures may include:

- Road design refinements

- Additional drainage infrastructure, for example catch drains and piped drainage
- Upgrades to existing piped drainage systems.

Further, the increase in runoff would be offset by the additional detention storage to be provided within and adjacent to Camdenville Park.

Localised and mainstream flooding impacts on Campbell Street from Lackey Street and Hutchinson Street were assessed as part of the assessment of potential flooding impacts along Campbell Street. The expected runoff would be designed to minimise adverse impacts on surrounding developments for up to the 100 year ARI. Potential impacts on Campbell Street would be mitigated by drainage upgrades which would be refined during the detailed design process. The design of the project and associated infrastructure layout would be designed to limit increases in peak discharges into the downstream drainage systems in accordance with the relevant local council requirements.

Surface water drainage and management infrastructure would be augmented, upgraded or replaced to accommodate runoff from the increased areas of impervious surfaces and the increased catchment areas around Campbell Road / Campbell Street at St Peters. This infrastructure would be designed to ensure that drainage systems that are of insufficient capacity would be modified or upgraded to cater for increased flows.

The detailed survey and condition assessment of existing drainage infrastructure would also include drainage assets in this area The proposed drainage strategy would be determined during detailed design with a focus on not increasing flows into the Eastern Channel for all events up to and including the 100 year ARI flood as outlined in environmental management measure FD17 of **Chapter 8** (Revised environmental management measures) in this report. The relevant local council or asset owner and operator would be consulted in relation to connection requirements during detailed design of the project.

As described in Section 18.4 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report), environmental management measures would include:

- Preparation of a FMS would be undertaken by a suitably qualified and experienced person in consultation with directly affected landowners, OEH, Sydney Water and the relevant local councils. The FMS would include:
  - Identification of flood risks to the project and adjoining areas, including consideration of local drainage catchment assessments and climate change implications on rainfall and drainage characteristics
  - Design and management measures to protect proposed operations and not worsen existing flooding characteristics during construction and operation, including soil erosion and scouring
  - Drainage system upgrades
  - All relevant flooding information shall be provided to Councils and NSW State Emergency Services to help inform emergency management plans
  - Preparation of a flood / emergency management plan.
- Management of adverse flood impacts through the FMS. This would include:
  - Development of detailed designs to mitigate the potential impacts of flooding, including designs of drainage infrastructure, road infrastructure, detention areas, and energy dissipation measures as appropriate.
  - A detailed hydrologic and hydraulic assessment into flooding behaviour and management measures required during detailed design
  - Design of works within the floodplain to minimise adverse impacts on surrounding development for flooding up to the 100 year ARI event. Assessment would investigate impacts a 100 year ARI flood and the probable maximum flood, in the context of impacts on critical infrastructure and flood hazards.

- Contingency plans to manage flooding particularly for areas within the 20 year ARI flood event zone.

An updated assessment would be undertaken during detailed design to determine the climate change related flood risks to the project in accordance with environmental management measure FD18 as described in **Chapter 8** (Revised environmental management measures) of this report. The assessment would be undertaken in accordance with the *Practical Considerations of Climate Change – Floodplain Risk Management Guideline* (DECC, 2007).

Issue description – Camdenville Park detention basin

Submissions requested that the upgrade works to the existing detention basin at Camdenville Park be designed to accommodate anticipated additional flows associated with the upgraded sections along Campbell Street / Campbell Road.

Response

The upgrade works to the existing detention basin at Camdenville Park have been designed to accommodate additional surface water drainage generated by the upgraded sections of Campbell Street and Campbell Road.

The assessment of operational flooding and drainage impacts described in Section 18.3.2 of the EIS identified that additional pavement areas from the widening of Campbell Street and adjoining streets may cause an increase in runoff within the catchment draining to Camdenville Park. To manage these impacts, the project would include improvements to the hydraulic standard of the drainage system servicing the roads that would be upgraded.

This increase in runoff would be managed by providing additional detention storage within and adjacent to Camdenville Park to limit increases in peak flow rates discharged to the downstream trunk drainage system. Table 18-4 presents a possible option to achieve this, which would include the following key elements:

- Enlargement of the existing detention basin by excavating to lower the existing ground level and the use of retaining walls adjacent to the upgraded sections of Bedwin Road and May Street. As this is a contaminated site, excavation would be planned accordingly
- Upgrade of the existing discharge system and associated infrastructure including rising mains to suit the enlarged basin, to renew those assets while maintaining the existing pumping capacity
- Construction of supplementary underground detention storage along the south-western side of Bedwin Road, within the space created by realignment of this road. This would be hydraulically connected to the upgraded basin, with discharge via an outlet control structure to the existing box culvert beneath the rail line. The need for this supplementary storage would be confirmed during detailed design.

The proposed drainage strategy would be refined during detailed design and would be based on not increasing flows into the sub-catchment for any event up to and including the 100 year ARI flood. The overall drainage strategy for the area would be developed in conjunction with the Sydney Metro City and South West project due to the potential combined impacts of both projects on the local drainage and flooding around the Camdenville Park detention basin.

Issue description – Coulson Street and Mitchell Road impacts

Submissions raised concern that the flooding and drainage assessment had not considered the potential localised flooding impacts along Coulson Street and Mitchell Road at St Peters, particularly during storm events.

Response

In relation to flooding impacts during the operation of the New M5 the flood model extent partially encompasses Coulson Street and Mitchell Road (refer to Figure 18-3 of the EIS) for mainstream flooding. Existing flood behaviour and impacts from the project for the 20 year ARI and 100 year ARI flood events do not extend north of these roads. As a result, it is unlikely that mainstream flooding impacts associated with the project would reach these streets.

The project would not involve construction works on Coulson Street, and as such, changes in drainage and potential localised flooding impacts during construction are not expected to occur.

The control and management of potential downstream localised flooding and drainage impacts during operation would be in accordance with local council requirements, including:

- Drainage systems that are of insufficient capacity would be upgraded to cater for increased flows
- Where new drains connect with existing drainage networks a survey and condition assessment would be undertaken to inform detailed design
- The efficiency of transverse drainage upgrades would be taken into account during detailed design
- The effects of a partial blockage of major hydraulic structures on flooding behaviour would be considered when determining finished road level and flood wall heights.

Potential impacts from localised flooding during construction and operation around Mitchell Road and nearby areas would be managed through the implementation of management measures as detailed in Section 18.4 of the EIS (as amended in **Chapter 8** (Revised environmental management measures)).

Issue description – flooding impacts around St Peters

Submissions expressed general concerns that the additional surface infrastructure and the removal of green space would worsen localised flooding impacts around St Peters.

Response

The assessment of potential flooding impacts described in Section 18.3 of the EIS identified that the new, upgraded or replaced surface water drainage and management infrastructure would be able to accommodate runoff from the increased areas of impervious surfaces and the increased catchment areas around project surface components. Changes to green space around St Peters on Sydney Park, May Street Reserve and Camdenville Park, including the introduction of new open space as part of the St Peters interchange have been included in the assessment of net change of impervious surface areas resulting from the project.

Section 18.3.2 of the EIS describes the potential flooding and drainage impacts during operation of the project. The assessment identified the potential for localised flood-related impacts associated with the upgrade works around the St Peters operation, but found that these would be adequately managed by both existing drainage and surface water management infrastructure in most areas. Where parts of the drainage infrastructure would be affected by the project and / or would require relocation, additional upgrades would be designed to manage potential flooding impacts.

The drainage structures incorporated into the project would include both existing drainage infrastructure around the interchanges, tie-in and integration works, and new operational ancillary facilities, which would be augmented to meet additional capacity requirements associated with increased impervious areas. Appropriate energy dissipation and scour protection would be provided downstream of relevant drainage infrastructure to prevent adverse impacts on bed and bank stability, and to protect the existing water quality of downstream watercourses. These drainage systems would be confirmed during the detailed designed phase and implemented to minimise potential impacts on receiving watercourses. The drainage systems that would form part of the project are detailed in Section 5.8.3 and Table 18-4 of the EIS.

Issue description - Bexley flooding impacts

One submission identified that the area around Bexley North Station is currently prone to flooding, and recommended that the depression at Bexley North Station be raised to manage potential flooding risk.

Response

The area to the north of the Bexley North Station along Wolli Creek is recognised as being subject to inundation under existing conditions. This is illustrated in Figure 4.1 (20 year ARI) and Figure 4.2 (100 year ARI) in the Technical working paper: Flooding (Appendix P of the EIS).

The flooding assessment presented in Chapter 18 and Appendix P of the EIS demonstrates that the project would have a negligible impact on existing flood levels around the Bexley North station. This is shown in Figure 5.1 (20 year ARI), Figure 5.2 (100 year ARI) and Figure 5.3 (200 year ARI) in Appendix P of the EIS, which indicate no more than a 0.01 metre (one centimetre) change in flood levels as a result of the project. Changes in probable maximum flood (PMF) levels are shown in Figure 5.4 in Appendix F of the EIS and would be between 0.01 metres and 0.10 metres (one to 10 centimetres) higher as a result of the project.

Based on the preliminary modelling presented in the EIS, the project would not have a significant impact on flooding around the Bexley North Station, therefore no further management or management measures are proposed in this location as part of the project. If required, measures to manage existing flooding issues are the responsibility of the land owner and / or the local council.

Issue description – increased stormwater flow to existing infrastructure

One submission raised concerns regarding the potential increases in stormwater volumes within the local council stormwater pit and pipe network. The submission requested specific details of the location and possible upgrade / changes to stormwater structures, and a detailed hydraulic assessment and understanding of the proposed performance of the system, if there are to be direct connections to the existing downstream stormwater system. Other submissions also raised concerns that existing pipe networks would no longer be functional.

Response

Chapter 18 and Appendix P (Technical working paper: Flooding) of the EIS present an assessment of the potential flooding risks and impacts of the project. It also considers the drainage impacts based on concept stormwater drainage arrangements that have been developed for the project.

Assessment of potential flooding and drainage impacts during operation include:

- Impacts from the operational water treatment plant
- Localised flooding
- Mainstream flooding.

Existing drainage and surface water management infrastructure as identified in Section 18.2 of the EIS would continue to manage surface drainage and potential flooding. Additional upgrades would be carried out where parts of the drainage infrastructure would be impacted by the project and / or would require relocation.

The drainage structures incorporated into the project would include existing drainage infrastructure around the interchanges (include the local council pit and pipe network), tie-in and integration works, and operational ancillary facilities which would be designed to meet additional capacity requirements associated with increased impervious areas. Appropriate energy dissipation and scour protection would be provided downstream of relevant drainage infrastructure to prevent adverse impacts on bed and bank stability, and to protect the existing water quality of downstream watercourses. These drainage systems confirmed during the detailed designed phase and implemented to minimise potential impacts on receiving watercourses.

Section 5.8.3 and Table 18-4 of the EIS present the drainage systems that would form part of the project.

The proposed upgrades and replacements of drainage infrastructure are in response to altered and increased catchments attributed to newly paved areas, which would increase the overall impervious areas within the project. Due to the urbanised nature and relatively flat topography in the area, the majority of new pipes would connect into existing networks prior to discharging as surface water. Further, the pavement drainage system would convey runoff collected from the 10 year ARI rainfall event. Drainage infrastructure would contain stormwater flow widths within the road shoulders, or one metre into the adjacent traffic lane where a shoulder is provided.

Design of the project's drainage infrastructure would continue to be developed and refined during the detailed design stage. **Chapter 8** (Revised environmental management measures) of this report sets out the requirements of a FMS that would be prepared in consultation directly affected landowners,

OEH, Sydney Water and the relevant local councils. The FMS would address residual flood impacts identified in the EIS, as well as any flood impacts identified following further design development and assessment.

Issue description – potential flooding risks to properties

Submissions raised concern that the flooding risks to downstream properties would be unacceptable, and that the project would impact overland flow paths.

Response

The flooding assessments presented in the EIS demonstrate that:

- The project would not result in more frequent inundations of property or the local road network over the full range of flood events
- The project would not increase the duration of flooding for all events up to the probable maximum flood
- The project would not affect existing evacuation routes.

Both qualitative and quantitative flooding assessments were undertaken within the Upper Wolli Creek floodplain, the Lower Cooks River floodplain and the Alexandra Canal floodplain, with results presented in Chapter 18 and Appendix P of the EIS. These extents are identified in Figure 18-1 to Figure 18-3 of the EIS.

Mainstream flooding impacts are summarised in Section 18.3.2 of the EIS, and include the impacts from an increase in runoff volumes, peak flows and / or time of concentration following rainfall events due to an increase in impermeable surfaces (i.e. operational infrastructure). Further details of the assessment of localised flooding impacts during construction and operation, and mainstream flooding impacts during construction are presented in the Technical working paper: Surface water (Appendix N of the EIS). The assessment of mainstream flooding impacts during operation is presented in Technical working paper: Flooding (Appendix P of the EIS).

The project may potentially increase the depth of above floor inundation in a number of residential properties that are located along the northern (upstream) side of Marsh Street opposite the Arncliffe motorway operations complex, and to the TransGrid Beaconsfield West Substation. The maximum increase in peak flood levels in these properties would be about 10 millimetres. The potential impacts would be confirmed during the detailed design of the Arncliffe motorway operations complex.

Floor level survey would be required to determine whether the project would result in above-floor inundation of these properties. Further investigations would be undertaken during detailed design to confirm the extent of works required to minimise the impact of the project on flooding conditions at these locations. This may also reduce the impact during a probable mean flood (refer to Section 5.2.2 of Appendix P of the EIS).

The assessment of operational flooding and drainage impacts described in Section 18.3.2 of the EIS identified that additional pavement areas from the widening of Campbell Street and adjoining streets may cause an increase in runoff within the catchment draining to Camdenville Park. To manage these impacts, the project would include improvements to the hydraulic standard of the drainage system servicing the roads that would be upgraded. This increase in runoff would be managed by providing additional detention storage within and adjacent to Camdenville Park to limit increases in peak flow rates discharged to the downstream trunk drainage system.

Issue description – Maddox Street impacts

Submissions raised concern that Maddox Street / Euston Road intersection lacks stormwater infrastructure and is frequently prone to flooding.

Response

Mainstream flood impacts do not extend to the Maddox Street / Euston Road intersection.

Potential localised flooding impacts during construction are detailed in Section 18.3.1 of the EIS.

Potential impacts would be relatively minor and would be effectively managed through the implementation of management measures, as detailed in Section 18.4 of the EIS.

In terms of managing localised flooding during operation of the project, existing drainage and surface water management infrastructure (identified in Table 18-2 of the EIS) would continue to manage surface drainage and potential flooding.

Additional upgrades would be carried out where parts of the drainage infrastructure would be impacted by the project and / or would require relocation. Table 18-4 of Section 18.3.2 provides an overview of the proposed drainage systems as part of the project. The corner of Euston Road and Maddox Street would have two 450 millimetre pipes installed that drain to the existing pipe drainage system.

The control and management of potential localised flooding and drainage impacts during operation would be in accordance with local council requirement and include:

- Drainage systems that are of insufficient capacity would be modified or upgraded to cater for increased flows
- Where new drains connect with existing drainage networks a survey and condition assessment would be undertaken to inform detailed design
- The efficiency of transverse drainage upgrades would be taken into account during detailed design
- The effects a partial blockage of major hydraulic structures on flooding behaviour would be considered when determining finished road level and flood wall heights.

5.18 Groundwater

5.18.1 Construction groundwater

No issues raised in community submissions were categorised under ‘construction groundwater’.

5.18.2 Operational ground water

One submitter raised issues regarding groundwater impacts during operation.

Issue description – Change in groundwater levels

Submissions raised concerns regarding impacts to the groundwater table from the project.

Response

Potential groundwater drawdown impacts during construction and operation of the project are discussed in Section 19.3.1 and Section 19.3.2 of the EIS

During the early stages of construction, the drawdown impacts (i.e. changes to the groundwater table) due to tunnel construction would be minimal even though groundwater inflows could be high due to high hydraulic gradients. That is, during tunnelling there is initially no drawdown of the water table, but eventually over time and certainly within tens of years the effects of depressurisation at depth would impact the water table causing a water table decline until equilibrium is reached (CDM Smith, 2015).

Groundwater modelling has been used to predict potential impacts on groundwater level as a result of tunnel drainage. Output from the groundwater model shows predicted groundwater table elevations after completion of the project (refer to Figure 19-7 of the EIS) and drawdown (i.e. the change in groundwater level) caused by the project (refer to Figure 19-8 EIS).

The groundwater elevations shown in Figure 19-8 of the EIS indicate an elongated cone of depression that is predicted to develop along the project tunnel alignments, especially to the west of the Cooks River. The groundwater table is predicted to remain relatively high near Bardwell Creek.

Drawdown of the groundwater table is predicted to be less where the project tunnels pass beneath the Cooks River and its connected alluvium, due to induced leakage from the river. Being connected to the ocean, the river can supply water to the tunnels below, without affecting water levels in the

river. It has been previously observed that higher inflows to tunnels beneath palaeovalleys may result from enhanced hydraulic conductivities due to fracturing. The groundwater model suggests that higher inflows can also be explained by the availability of water and rapid transfer of water to alluvium over underlying rock.

To the east of the Cooks River, heading eastwards from the edge of the alluvium, the extent of predicted drawdown will increase significantly. The sudden change in drawdown as the project alignment approaches St Peters will be due to the tunnels transitioning from sandstone into shale.

Drawdown does not extend far into the main Botany Sands aquifer, because this geological unit is able to transmit water (due to its higher hydraulic conductivity) with relatively flat hydraulic gradients. Groundwater heads are currently depressed in the Alexandria Landfill due to continuous pumping of leachate and the requirement to keep it at certain elevation to prevent migration of contamination. Groundwater modelling predicts therefore that the project would have limited impact on groundwater heads in the area of the Alexandria Landfill. Construction of the barrier wall would prevent current dewatering of the Botany Sands aquifer.

Potential impacts to groundwater dependent ecosystems as a result of groundwater drawdown from the project are detailed in **Section 5.20** of this report and in Section 21.3.1 of the EIS.

5.18.3 Settlement

No issues raised in community submissions were categorised under ‘settlement’.

5.18.4 Groundwater monitoring

No issues raised in community submissions were categorised under ‘groundwater monitoring’.

5.18.5 Settlement monitoring

No issues raised in community submissions were categorised under ‘settlement monitoring’.

5.19 Non-Aboriginal heritage

5.19.1 Direct impacts to heritage items

1,491 submitters raised issues regarding direct impacts to heritage items.

Issue description – impacts to heritage items

Concerns were raised over the potential impacts (including demolition) to heritage buildings and precincts in St Peters and Sydney’s inner west. Specific concerns included vibration causing termite displacement, soil pH changes and movement of clay.

Response

During the development of the project design, one of the key objectives was to minimise impacts on listed heritage items. Impacts to built heritage, heritage landscapes and historical archaeological sites would, to the greatest extent practicable, be avoided and minimised. Impacts have been minimised and the preferred design has been amended to avoid impacts to heritage features, where possible.

Construction of a transport infrastructure project of this scale in an established urban area would inevitably generate a range of localised impacts. For this project one of the impacts that cannot be avoided is the demolition of housing, including listed and contributory heritage items, within heritage conservation areas. Ultimately 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 reports and management measures are recommended to minimise impacts where possible.

Section 20.3 of the EIS provides an impact assessment of non-Aboriginal heritage. The assessment identifies direct, potentially direct and indirect impacts on non-Aboriginal heritage items. Fifty seven non-Aboriginal heritage items are expected to be directly or indirectly impacted by the project. Table 20-6 of the EIS provides a summary of the impact assessment and lists all 57 heritage items and the degree of impact.

Of the 57 heritage items, three items would be demolished as a result of the project, these are:

- Warehouse 'Rudders Bond Store' – 53-57 Campbell Road at St Peters (ID No I1405 under the *Sydney Local Environmental Plan 2012*)
- Terrace group – 28-44 Campbell Street at St Peters (ID No 4305629 under the Roads and Maritime Section 170 Heritage and Conservation Register)
- House – 82 Campbell Street at St Peters (ID No 4305643 under the Roads and Maritime Section 170 Heritage and Conservation Register).

Section 5.5 of the Technical working paper: Noise and vibration (Appendix J of the EIS) provides an assessment of potential construction vibration impacts as a result of works at surface and below ground (tunnelling). It concludes that, for tunnelling activities, the predicted vibration levels at heritage items are estimated to be around two millimetres per second or less, which is below the recommended maximum level of vibration that would be applicable to heritage structures set within the *German Standard DIN 4150 - Part 3 - Structural Vibration in Buildings – Effects of Vibration on Structures*. The recommended structural damage vibration limits are identified in Table 12-7 of the EIS.

The potential impacts on heritage structures as a result of ground settlement (including clay) would be dependent on the geotechnical conditions, the depth of the tunnelling activity, the number of storeys of the building, and the position, condition and masonry of the structure itself. The calculated settlement for the project is generally less than 20 millimetres for the majority of the tunnel alignment. Locations of peak settlement are at the portals and at the Y-junction caverns. All heritage structures have a predicted settlement of less than 20 millimetres and are assessed as having a building damage category of 'negligible.' It is expected that settlement would stabilise within two months of the roadheader passing under a structure. Section 19.3.2 of the EIS provides an assessment of the potential impacts of ground settlement on structures.

Further assessments would be undertaken during detailed design to determine the level of potential impact on structures and to identify appropriate management measures to minimise these impacts. For some properties, this may involve undertaking an existing condition survey and a program of monitoring.

Sites directly affected by construction works, including demolition of structures, would consider the potential for, and where necessary treat, termites consistent with *AS 4349.3 2010 Inspection of Buildings – Timber Pest Inspections* and *AS 3660.2 2000 Termite Management In and Around Existing Buildings and Structures*. Outside of the areas directly affected by project construction works, vibration levels associated with the construction and operation of the project would be similar to other existing vibration sources in the natural and built environments. The project is therefore not anticipated to alter the likely mobility of termites in these areas beyond what is currently the case.

Based on local and regional geology, the project poses a low risk of changes in soil pH except in areas of acid sulfate soils where those soils are dewatered and / or exposed. Areas of known or potential acid sulfate soils would be effectively managed through the preparation and implementation of an Acid Sulfate Soil Management Plan (environmental management measure SW09 (as revised in **Chapter 8** (Revised environmental management measures) of this report)). Indirect dewatering of acid sulfate soils through groundwater drawdown would pose a low risk of pH change and consequential impacts on structures because:

- Acid sulfate soils are generally associated with watercourse alluviums, which would be maintained in a saturated state by the overlying watercourse and therefore would not be oxidised through dewatering and exposure to air
- Structures, and particularly more sensitive heritage structures, are generally not located within areas of known or potential acid sulfate soils, or have been constructed to minimise the risk of corrosion from low pH soils.

The detailed design, documentation and construction of the project would be managed to ensure that, as far as possible, the identified potential for heritage and archaeological impacts is avoided or minimised. Where impacts are unavoidable, works would be undertaken in accordance with the strategy outlined in the construction heritage management plan and the management measures

outlined in Section 20.4 of EIS (and amended in **Chapter 8** (Revised environmental management measures) of this report) and include:

- The removal, change of use or modification of heritage listed structures would be subject to specific management measures (refer to Section 20.4 of the EIS, as amended in **Chapter 8** (Revised environmental management measures) of this report, for details). Where direct impacts to heritage items are expected, a full archival recording following the NSW Heritage Division guidelines *How to Prepare an Archival Recording* (NSW Heritage Office, 2003) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006) would be carried out. Consideration would be given as to whether elements of the heritage items could be salvaged and for maintenance and conservation of other heritage properties in the area
- The implementation of a construction heritage management plan
- Specific measures for potentially impacted heritage conservation areas
- Safe working distances for surface works, including existing condition survey reports and program of monitoring to identify early potential risks at a number of non-Aboriginal heritage items.

Issue description – cumulative impacts to heritage items

Concerns were raised that the EIS does not appropriately assess the cumulative impacts on heritage items including areas associated with the project and urban and residential redevelopment of St Peters and the inner west.

Response

The assessment of potential impacts to heritage and urban conservation areas is described in Section 20.3 of the EIS. The assessment considered the degree of impact the project would have on heritage conservation areas and heritage items (being negligible, minor or significant) (refer to Section 20.1.1 of the EIS). The outcomes of this assessment are presented in Section 7.0 and Section 9.0 of the Technical working paper: Non-Aboriginal heritage (Appendix R of the EIS). The assessment addresses the total, cumulative impact of all aspects of the project, which includes a direct or indirect impact on 57 heritage items.

Other motorways and infrastructure including residential and commercial developments which are already built are considered as being part of the existing environment (refer to Section 20.2 of the EIS) and are therefore included within the assessment. Assessment of potential future development or redevelopment of St Peters and the inner west are beyond the scope of the project and the assessment of potential heritage impacts.

Two non-statutory conservation areas are adjacent to the existing M5 Motorway: the Pallamanna Parade and Welfare Avenue Urban Conservation Area. These are listed on the Register of the National Estate, which has ceased to be a statutory list. These areas are separated from the M5 Motorway by noise walls and roadside vegetation. As outlined in Table 20-6 of the EIS, the Clemton Park Urban Conservation Area would experience minor secondary direct impacts from vibration during surface works, and the Pallamanna Parade and Welfare Avenue Urban Conservation Area would experience negligible secondary direct impacts from vibration during surface works. These impacts during the construction of the project would be effectively managed with the measures outlined in Table 20-7 of the EIS.

Section 5.3 of the Technical working paper (Appendix R of the EIS) also considered potential impacts of the project on non-Aboriginal heritage along King Street at Newtown in response to concerns which were expressed during consultation conducted during the preparation of the EIS. No effects to the heritage values of the King Street heritage conservation area were identified.

Cumulative non-Aboriginal heritage impacts in relation to other WestConnex projects are discussed in Section 27.4 of the EIS. The cumulative impact assessment identified that there are no cumulative impacts to non-Aboriginal heritage expected as a result of the WestConnex program of works.

Visual impacts to heritage items in the context of the WestConnex program of works would be considered further during detailed design (i.e. existing vistas and view lines). Rehabilitation strategies sympathetic to heritage items would be determined and in these cases, the overall heritage value of the heritage items would not be significantly impacted by the project.

Impacts resulting from the M4–M5 Link would be assessed as part of the planning process / EIS for that project.

5.19.2 Impacts to heritage conservation areas

18 submitters raised issues regarding heritage conservation areas to be impacted upon by the project.

Issue description – impact on heritage buildings within heritage conservation areas

Concerns were raised regarding tunnel construction and its potential to put at risk the heritage values of heritage conservation areas, including the structural integrity of buildings and heritage conservation areas within or adjacent to the project footprint.

Response

Based on the predicted vibration levels and settlement levels at heritage items, the structural integrity of heritage buildings is not expected to be placed at risk during construction of the project. Details of direct impacts to heritage items are provided in **Section 5.19.2** of this report.

As described in Section 20.2.2 of the EIS, the review of heritage registers and databases identified 57 individual heritage items within the study area (refer to Table 20-4 and Figure 20-1 of the EIS). In addition, seven broad, landscape based heritage listings were identified, consisting of:

- Pallamanna Parade Urban Conservation Area
- Kingsgrove East Urban Conservation Area
- Clemton Park Urban Conservation Area
- Bardwell Park Urban Conservation Area
- Goodsell Estate Heritage Conservation Area
- Cooper Estate Conservation Area
- Sydenham Village.

The location of these urban and heritage conservation areas in relation to the project footprint are detailed in Figure 20-2 to Figure 20-6 of the EIS. These figures also show heritage items in the context of the heritage conservation areas. The significance of these areas is discussed further in Section 6.0 of the Technical working paper: Non-Aboriginal heritage in Appendix R of the EIS.

The assessment of potential impacts to heritage and urban conservation areas is described in Section 20.3 of the EIS. The assessment considered the degree of impact the project would have on heritage conservation areas and heritage items (being negligible, minor or significant) (refer to Section 20.1.1 of the EIS). The outcomes of this assessment are presented in Section 7.0 and Section 9.0 of the Technical working paper: Non-Aboriginal heritage (Appendix R of the EIS).

Table 20-6 of the EIS summarises the impacts on heritage items and heritage conservation areas. Impacts to the following three heritage conservation areas are outlined in Table 20-6:

- Goodsell Estate Heritage Conservation Area (C16)
- Clemton Park Urban Conservation Area (#102071)
- Pallamanna Parade Urban Conservation Area (#102089).

Based on the assessment presented in Table 20-6 of the EIS, the Goodsell Estate Heritage Conservation Area was the only heritage conservation area identified as likely to experience minor direct impacts, for instance, through surface works and acquisition, with the other two experiencing negligible direct impacts, as well as minor secondary direct impacts from vibration during surface works in the case of Clemton Park Urban Conservation Area. These impacts to the Clemton Park Urban Conservation Area and the Pallamanna Parade Urban Conservation Area would be effectively managed with the measures outlined in Table 20-7 of the EIS.

A statement of heritage impact was prepared for the Goodsell Estate Heritage Conservation Area. The statement of heritage impact for the Goodsell Heritage Conservation Area found that as a consequence of local road upgrades, which would include the realignment of the intersection of Bedwin Road, Unwins Bridge Road, Campbell Street and May Street, the project would require the acquisition of the south western corner of the Goodsell Heritage Conservation Area. This section proposed for acquisition is currently part of the Camdenville Park and is a fenced area providing a depression for the collection of stormwater runoff. The project would augment this stormwater basin to cater for the operation of the project and would affect the curtilage of the Goodsell Heritage Conservation Area as a result. The statement of heritage impact prepared for this heritage conservation area concluded that these minor project works would not impact on the overall heritage significance of the conservation area.

The early identification of non-Aboriginal heritage items and conservation areas during the design phase informed the project design and enabled the avoidance of heritage items where practicable.

The management measures provided in Table 20-7 of the EIS (and amended in **Chapter 8** (Revised environmental management measures) of this report)) were developed to avoid, reduce and manage identified potential impacts to non-Aboriginal heritage. These measures would be developed further on a case by case basis during detailed design, with consideration of finalised areas of disturbance. The final suite of management measures would be documented within the Construction Environmental Management Plan.

Heritage specialists would work with Roads and Maritime to ensure that appropriate management measures are implemented and impacts to heritage items minimised. The heritage significance of particular sites and localities would also be interpreted through signage and other means, where reasonable and feasible and as part of the urban landscape strategy.

Specific management measures have been developed to manage potential impacts to the Goodsell Estate Heritage Conservation Area as a result of vibration, acquisition and modification, as well as visual impacts and impacts conservation area values. These include:

- Landscaping, to mitigate the impacts of realigning and widening roads, as well as alterations to the existing stormwater detention basin
- Surface works would adhere to safe working distances
- An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conversation area and within 50 metres of the main alignment tunnels.

Specific management measures to manage potential impacts to the Clemton Park Urban Conservation Area and the Pallamanna Parade Urban Conservation Area as a result of vibration, changes in heritage area conservation values, and visual impacts would include:

- Surface works would adhere to safe working distances
- An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area
- Landscaping to provide screening once established.

5.19.3 Potential indirect impacts

12 submitters raised issues regarding indirect impacts to heritage.

Issue description – increased traffic congestion in heritage areas

Concerns were raised regarding the St Peters interchange and its potential for increased traffic to indirectly impact heritage conservation areas or heritage items. Submissions stated that heritage items would become isolated due to the increase in traffic.

Response

Impacts to traffic and access are outlined in more detail in Section 9.3.1 and Section 9.3.2 (Traffic and transport) of the EIS. Increased road traffic has the potential to indirectly impact on heritage items and heritage conservation areas as a result of increased traffic volumes and increased noise and vibration.

Table 20-6 of the EIS found that some heritage items and heritage conservation areas in the vicinity of the St Peters interchange and local road works area may experience minor or negligible impacts, including as a result of reduced visual amenity, vibration during surface works, and the need for at-property acoustic treatments. However, Section 20.3 of the EIS did not predict any impacts to these heritage items or heritage conservation areas solely as a result of increased traffic congestion.

In fact, without the project, traffic volumes on key local roads around St Peters are generally expected to increase due to projected population growth in the area. Intersection performance along local roads around St Peters interchange would also deteriorate as a result of the associated traffic growth.

Without the local road upgrades and the WestConnex project, this forecast growth in traffic would cause further congestion, with the network unable to accommodate the expected demand. By 2031, motorists travelling in the afternoon peak would experience significant congestion compared to today. This is forecast to result in a 67 per cent increase in travel times, a 40 per cent decrease in speeds and increasing delays at some intersections.

This suggests that isolation impacts due to an increase in traffic would occur without the project. Submission queries regarding community isolation and segmentation are further discussed in Section 5.14.1 of this report.

In relation to the heritage listed Alexandra Canal, the Alexandra Canal bridge design, where reasonable and feasible, would be set back from the edge of the Canal to allow unimpeded pedestrian access during operation. The increased number of crossings, and particularly the pedestrian / cycle bridge adjacent to the Campbell Road Bridge would improve access to and visibility of the Canal as opposed to causing road and pedestrian congestion at this heritage item.

Whilst it does not lie directly within the project area, a further assessment was undertaken of potential traffic impacts to the King Street / Enmore Road Heritage Conservation Area (listed under both the *Sydney Local Environmental Plan 2012* and *Marrickville Local Environmental Plan 2011*). This heritage conservation area is identified as being of State heritage significance, although it is not listed on the State Heritage Register.

Consultation during the preparation of the EIS identified a stakeholder concern that the project would impact King Street and its retail function, thereby impacting the heritage significance of the King Street / Enmore Road Heritage Conservation Area.

The project would not modify King Street, including by way of speed limits or on-street parking arrangements. Traffic modelling (refer to Section 9.3.2 of the EIS) has indicated that the future traffic volumes would be within existing design capacity. No impacts would therefore occur to the heritage value of the King Street / Enmore Road Heritage Conservation Area as a result of traffic volumes.

Issue description – visual impacts to heritage areas

A submission expressed concern that the amenity of the Victoria heritage urban environment would be impacted by the overpowering effect of the project's design, in particular references were made to Newtown and Alexandria.

Response

The project aims to use 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. In the majority of cases, impacts to the heritage items as a result of visual effects are therefore anticipated to be minor (refer to Sections 14.3.1 and 14.3.2 of the EIS). Further, visual impacts to affected heritage items would be reduced in part by distance and the screening effect of surrounding residential developments and proposed landscaping. Existing vistas and view lines from heritage items would be considered during detailed design, and rehabilitation strategies sympathetic to the heritage item would be determined. In these cases, the overall heritage value of the heritage items would not be significantly impacted by the project.

However, the impact to Alexandra Canal is considered to be significant due to the introduction of new crossings of the Canal. For this reason the item was carried forward for further consideration in a statement of heritage impact.

Further information on indirect visual impacts to heritage items, and recommended measures to mitigate these impacts, are provided in Section 14.4 (Visual impact and urban design) of the EIS.

Visual impacts to heritage items in the context of the WestConnex program of works would be considered further during detailed design (i.e. existing vistas and view lines). Rehabilitation strategies sympathetic to heritage items would be determined and in these cases, the overall heritage value of the heritage items would not be significantly impacted by the project.

Issue description – access impacts to St Peters Church

ubmissions raised concern that the project would impact the accessibility of the heritage listed St Peters Anglican Church.

Response

The St Peters Anglican Church is located around 150 metres to the west of St Peters interchange on the Princes Highway. Access to the St Peters Anglican Church would be maintained during both construction and operation of the project.

Generally, temporary road pavements would be constructed as early as possible within the construction program to remove live traffic from construction work zones. However, a number of phases of traffic management and traffic switches would be required to facilitate construction.

During construction, Princes Highway would be subject to temporary partial and full road closures, and diversions to facilitate construction (as detailed in Table 6-22 of the EIS). The staging of any closure or modifications would include:

- Temporary diversions would be required during various stages of construction
- Three lanes would generally be maintained in each direction, with temporary closures to two lanes in each direction required for central pavement works, installation of barriers and associated construction activities
- Traffic signals at the intersection with Campbell Street would be maintained, including provision for pedestrian crossing
- Access would be maintained with businesses, residents and facilities.

The temporary closure and modifications to Princes Highway would ensure the functionality of surrounding roads is maintained, provided access and ensuring the safety of members of the public, motorists and construction personnel.

Issue description – heritage impacts to brickmaking and industrial areas

Submissions raised concern that archaeological features associated with historical former brickmaking and industrial activities in the area to the eastern side of the Princes Highway south to Canal Road have not been assessed adequately and would be impacted.

Response

The non-Aboriginal heritage assessment was prepared in accordance with the SEARs. Archaeological features associated with historical former brickmaking and industrial activities in the area to the eastern side of the Princes Highway south to Canal Road were assessed in Section 20.3 and Appendix R (Technical Working paper: Non-Aboriginal heritage) of the EIS. The key findings of the assessment included:

- That it would be unlikely that relics (eg structural remains) or deposits associated with the Central Brick and Tile Company remains *in situ* as any remains are likely to have been disturbed by subsequent landfill related activities
- Austral Brick Company established kilns and a brickpit, separate from that operated Central Brick and Tile Company discussed above, on the intersection of Princes Highway and Canal Road, extending south along Canal Road
- With the exception of a small section on the corner of Princes Highway and Canal Road, these areas were excavated below grade. It is therefore considered unlikely that relics associated with the Austral Brick Company would remain outside areas of the corner of Princes Highway and Canal Road. No substantial ground disturbance works are planned for this Princes Highway and Canal Road area as it contains a heritage item that is being retained (discussed further below as the St Peters Brickpit Geological Site). It is considered unlikely that landscaping works or similar around the heritage item are likely to encounter relics
- The local road upgrades are largely being undertaken within current road reserves and associated footpaths or in developed industrial areas. Areas of archaeological potential anticipated within the areas likely to be disturbed by these works would be limited. Exceptions to this include works along Campbell and Euston Roads and the intersection of Euston Road and Sydney Park Road (formerly Huntley Street).

The St Peters Brickpit Geological Site (RNE #16240) would be modified as a result of the project. A statement of heritage impact was prepared for this heritage item, which is summarised in Section 20.3.1 of the EIS and detailed in Table 68 of Appendix R: Technical working paper: Non-Aboriginal heritage in the EIS. The statement of heritage impact identifies that the project would result in the modification of the geological site, but ultimately, the geological features would be preserved within undisturbed or newly exposed cuttings. In addition, the public access created by the interchange would allow for greater public knowledge of the geological and palaeontological significance of the site and the Sydney basin more generally.

Archaeological management measures would be governed by the Construction Heritage Management Plan which would be developed in consultation with OEH and the Heritage Council (for non-aboriginal heritage). Key measures would include:

- An archival recording of the St Peters Brickpit geological site would be undertaken prior to and during the construction
- An assessment and / or consultation with a palaeontologist to determine whether the project impact area has potential to contain further specimens of scientific interest
- Protocols would be developed for anticipated categories of unexpected non-Aboriginal heritage finds, such as tram infrastructure, late 19th to early 20th refuse, and brick works. In the event of an unexpected cultural heritage find outside of these specific protocols, the *Standard Management Procedure – Unexpected Archaeological Finds* (Roads and Maritime, 2015a) would be followed. This would include notification to the NSW Heritage Division of OEH
- As part of the construction heritage management plan, an overarching historical archaeological research design would be prepared prior to commencement of construction in consultation with the NSW Heritage Division of OEH. It would describe clear significance thresholds to possible archaeological items that may be uncovered during works and designate when monitoring, testing and / or salvage and excavation should occur in relation to the project works and timing. Post-excavation reporting, including artefact analysis and additional historical research (where necessary), would be required for any historical archaeological investigations undertaken.

The construction heritage management plan would include detailed procedures / strategies for the conservation and curation of any historical artefacts recovered during works.

5.20 Biodiversity

5.20.1 Vegetation clearing

2,531 submitters raised issues regarding impacts resulting from vegetation clearing.

Issue description – vegetation loss

Submissions stated that the project would result in a loss of vegetation alongside local roads and within public gardens. The following specific concerns were raised:

- Vegetation clearing within the confines and vicinity of Sydney Park
- Vegetation clearing on the border of Bedwin Road and Camdenville Park at St Peters
- The removal of a stand of mature Melaleuca trees on the boundary of Sydney Park and Euston Road at Alexandria
- Vegetation clearing within M5 Linear Park and Beverly Grove
- Vegetation removal adjacent to Bexley Road at Kingsgrove
- The total quantity of vegetation to be cleared
- Vegetation removal would result in significant losses to biodiversity
- Concern proposed limits of vegetation clearance would not be adhered to during construction of the project.

Response

The project was designed with the aim of avoiding impacts to known areas of ecological sensitivity, where feasible. The project has avoided impacts to high quality vegetation and a vegetated riparian corridor in the Wolli Creek Valley, a small area of Sydney Turpentine Ironbark Forest in Kingsgrove, a Grey-headed Flying Fox camp and habitat at Turella and areas of native coastal reedland and mangroves at the confluence of Wolli Creek and the Cooks River.

However, some impacts on areas of ecological sensitivity were unavoidable due to the required footprint of the project. These unavoidable impacts would include impacts to threatened ecological communities and threatened species. Notwithstanding, opportunities to avoid and minimise the extent of vegetation clearing would continue to be considered during detailed design.

Section 21.3.1 of the EIS provides an assessment of the impacts of vegetation clearance required for construction of the project. For the purposes of this assessment, a worst case disturbance area of vegetation was assumed.

Vegetation clearing within Sydney Park, including Melaleuca on the boundary of Sydney Park and Euston Road

Vegetation within Sydney Park that is situated within the construction footprint of the project is classified as urban native and exotic vegetation. The Biodiversity Assessment Report (Appendix S of the EIS) notes that parklands within the study area generally contain large established trees (native and exotic) over exotic grasses, with no shrub layer or evidence of regenerating over-storey species. The clearance of established trees, including native species such as Melaleucas, is unavoidable due to the required footprint of the project. Notwithstanding, opportunities to avoid and minimise the extent of vegetation clearing would continue to be considered during detailed design of the project.

The local road upgrades component of the project has been designed to create a series of tree lined streets for local residents and users of the area and to integrate the local streetscape with adjacent open space and parkland, particularly in the vicinity of Sydney Park (refer to the Urban Design Report in Appendix L of the EIS). Tree and landscape plantings would be designed to match City of Sydney Council guidelines. Street tree plantings along Euston Road would comprise native species and would aim to complement and reinforce the Melaleuca plantings present within and in the vicinity of Sydney Park.

Vegetation clearing on the border of Bedwin Road and Camdenville Park

Vegetation on the corner of Bedwin Road and May Street within Camdenville Park is classified as urban native and exotic. Clearance of vegetation in this area is unavoidable due to the required footprint of the project and the need to upgrade the stormwater drainage basin within the park to accommodate the increase in impervious surfaces as a result of the project. Impacts to this community has been excluded from impact assessment as it is not native vegetation and the original plant community type cannot be determined.

However, removal of this vegetation would result in visual and landscape character impacts. At completion of construction, cleared areas would be rehabilitated and landscaped in accordance with the WestConnex Urban Design Framework. The framework would be delivered through a landscape and urban design plan which would be prepared in consultation with Marrickville council.

Vegetation clearing within M5 Linear Park and Beverly Grove

Vegetation within M5 Linear Park within the construction footprint of the project is classified as both urban native and exotic and native vegetation. The majority of the clearance required would be of urban exotic and native vegetation with the exceptions being an area of Cooks River Castlereagh Ironbark Forest (1.4 hectares) adjacent to the Canterbury Golf Course and a small area of Bloodwood – Sydney Peppermint heathy open forest (0.09 hectares). Clearance of vegetation in these areas is unavoidable due to the required footprint of the project and the need to conduct the western surface works road widening adjacent to the existing M5 East within the road reserve. Opportunities to avoid and minimise the extent of vegetation clearing would continue to be considered during detailed design of the project.

Cooks River Castlereagh Ironbark Forest to be cleared for the project meets the definition of the Cooks River Castlereagh Ironbark Forest threatened ecological community under the Threatened Species Conservation Act 1995 (TSC Act) and Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The assessment of the significance of clearing Cooks River Castlereagh Ironbark Forest against the EPBC Act significant impact criteria (Commonwealth Department of the Environment, 2015) determined that despite the provision of management measures, there is likely to be a significant impact on this threatened ecological community. This reflects the limited remaining areas of this community within the Sydney Basin bioregion and its status as a critically endangered ecological community under the EPBC Act and as an endangered ecological community under the TSC Act.

Impacts to the Cooks River Castlereagh Ironbark Forest threatened ecological community would be offset in accordance with the Framework for Biodiversity Assessment (FBA) (NSW Office of Environment and Heritage, 2014). Additional information regarding the biodiversity offsets strategy for the project is provided in Section 21.4.1 and Appendix T (Biodiversity Offsets Strategy) of the EIS.

Further the residual area of Cooks River Castlereagh Ironbark Forest remaining following construction would continue to be managed for its ecological values by Roads and Maritime Services.

Vegetation removal adjacent to Bexley Road

The project would require the removal of vegetation on both sides of Bexley Road to accommodate the construction of the Bexley Road North (C4), Bexley Road South (C5) and Bexley Road East (C6) construction compounds. The majority of the vegetation in these compounds within the construction footprint is classified as urban exotic and native. However, construction of the Bexley Road East construction compound would require the removal of 0.09 hectares of Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest. This community is not listed under the TSC ACT or EPBC Act as threatened or endangered. Opportunities to avoid and minimise the extent of vegetation clearing would continue to be considered during detailed design of the project.

A number of mitigation and management measures would be detailed within a flora and fauna management plan, which would be prepared with consideration to the *Roads and Maritime Biodiversity Guidelines – Protecting and Managing Biodiversity on Roads and Maritime Projects* (the Biodiversity Guidelines) (Roads and Traffic Authority 2011) to manage the impacts associated with vegetation clearance.

Total quantity of vegetation to be cleared

The worst case disturbance footprint for the project would require the removal of 10.76 hectares of vegetation, comprising a mixture of native vegetation communities (3.31 hectares) and urban native and exotic vegetation (7.45 hectares). A summary of vegetation to be cleared for the project is included in Table 21-9 in Chapter 21 of the EIS.

Landscaping and revegetation as the part of the project would include planting of around 2,800 mature trees and about 4,000 juvenile trees (as part of massed planting areas). The total area to be landscaped and replanted would be around 17.5 hectares. This would result in a net gain of around 6.7 hectares of vegetated open space as a result of the project.

Proposed limits of vegetation clearance

During construction of the project, Roads and Maritime would be bound by the prescribed limits of vegetation clearance outlined in the EIS as well as any conditions of approval imposed by the NSW Minister for Planning.

5.20.2 Threatened and endangered species and ecological communities

1,655 submitters raised issues regarding impacts to threatened and endangered species and ecological communities.

Issue description – impacts of the project on flora

Submissions focussed on issues regarding impacts to flora as a result of the project. Submissions raised the following specific concerns:

- The assessment downplays the significance of flora that would be impacted by the project
- A reduction in gains made by previous native bushland regeneration efforts
- Impact of reduced air quality on flora due to the St Peters ventilation outlet.

Response

The biodiversity assessment included an assessment of the significance of flora that would be impacted by the project. As identified in its submission on the EIS, the Office of Environment and Heritage (OEH) considers that the biodiversity assessment for the project has been undertaken correctly and reaches an accurate conclusion on the significance of the impacts.

An assessment of impacts of the project on flora is included in Chapter 21 and Appendix S (Biodiversity Assessment Report) of the EIS. A summary of this assessment has been provided below.

Field surveys were undertaken in 2014 to determine the presence and significance of flora and vegetation communities. The most significant areas of vegetation include Wolli Creek Regional Park, to the north of the project, and Cooks River Castlereagh Ironbark Forest at the westernmost end of Beverly Grove Park, Beverly Hills. Cooks River Castlereagh Ironbark Forest and Sydney Turpentine Ironbark Forest are both listed as critically endangered ecological communities and Paperbark Swamp Forest is listed as an endangered ecological community. The Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest is not listed as a significant community, but as a pocket of remnant vegetation it provides value to the urban landscape.

Of the 3.31 hectares of native vegetation clearing to be undertaken for the project, less than half (1.4 hectares) is classified as a threatened vegetation community. The remainder of the clearing would be in planted vegetation or small patches of remnant native vegetation.

A database search of the EPBC Protected Matters Search Tool and the NSW Wildlife Atlas identified 50 threatened flora species and four threatened flora populations listed as vulnerable, endangered or critically endangered under the EPBC Act and / or TSC Act as occurring or potentially occurring within 10 kilometres of the project.

Species identified during the database searches were compared against the habitat features present within the biodiversity study area to determine whether the species are likely to be present and subsequently if there is a requirement for a targeted survey to be conducted. Field surveys did not record any threatened flora species or populations within the biodiversity study area. Additionally, none of the identified species are considered likely to occur in the study area due to the degraded condition of the vegetation.

Persoonia hirsuta (Hairy Geebung), *Pimelia spicata* (Spiked Rice-flower) and *Tetratheca juncea* (Black-eyed Susan) have been specified in the Commonwealth guidelines for the project as potentially being at risk from the project. However, the field surveys undertaken as part of the biodiversity assessment did not record these species within the biodiversity study area. Further, any potential habitat present within the biodiversity study area would be highly modified and unlikely to support these species. As such, these species are considered unlikely to occur.

Vegetated areas adjacent to the M5 East Motorway were mapped as urban native and exotic vegetation primarily consisting of regenerating canopy species above a shrub layer but with no large established trees. While these areas add to the green spaces the species themselves are not significant in terms of biodiversity. Where possible these areas would be replanted and landscaped at the completion of construction.

It is acknowledged that the project would require clearance of native bushland that has been the focus of community regeneration efforts. These impacts to native vegetation would be compensated for through new plantings of native species. Landscaping and revegetation as the part of the project would include planting of around 2800 mature trees and about 4000 juvenile trees (as part of massed planting areas). The total area to be landscaped and replanted would be around 17.5 hectares. This would result in a net gain of around 6.7 hectares of vegetated open space as a result of the project.

The air quality impact assessment presented in Appendix H of the EIS demonstrates that in most areas there would either be no change or a small improvement in air quality as a result of the project. However in some areas, including along major roads and some local road upgrades around Sydney Park a small increase in pollutant concentrations may occur. These increases in pollutant concentrations are the result of increased and redistributed traffic on surface roads (rather than from ventilation outlets). The increases in pollutant concentrations would be confined to the road corridor and immediately adjacent land. Based on the outcomes of the air quality impact assessment, the project would either not change existing quality of air in vegetation areas or would lead to a minor deterioration in the quality of air for a small area of landscape vegetation along some major roads and local road upgrades.

Issue description – impacts of the project on native fauna

Submissions expressed concern that the project would impact on native fauna (endangered or otherwise). A number of submissions raised particular reference to the following:

- Reduced air quality due to the St Peters ventilation outlet
- Impacts from construction processes (i.e. chemicals, noise)
- Increased noise pollution
- Reduction in viable habitat
- Impacts on fauna, including fauna residing in Sydney Park including:
  - Sacred Ibis (or White Ibis),
  - Black Swan
  - Endangered waterfowl within Sydney Park and wetlands
  - Red-rumped bul buls
  - Koels
  - Butcher birds
  - Lorikeets

- New England Honey-eaters
- Ring-tailed possum

- Concern that the removal of vegetation from the noise mound adjacent to the M5 East Motorway in Kingsgrove would impact birds and a particular concern was raised regarding impacts on Black Cockatoo populations.

Response

The assessment of impacts on native fauna is included in Chapter 21 and Appendix S (Biodiversity Assessment Report) of the EIS.

Reduced air quality

The air quality impact assessment presented in Appendix H of the EIS demonstrates that in most areas there would either be no change or a small improvement in air quality as a result of the project. However in some areas, including along major roads and some local road upgrades in St Peters where a small increase in pollutant concentrations may occur. These increases in pollutant concentrations are the result of increased and redistributed traffic on surface roads (rather than from ventilation outlets). The increases in pollutant concentrations would be confined to the road corridor and immediately adjacent land. Based on the outcomes of the air quality impact assessment, the project would either not change the existing quality of air in areas used by fauna for habitat or would lead to a minor deterioration in the quality of air for a small area of potential transient habitat for fauna along some major roads and local road upgrades.

Impacts from construction processes (i.e. noise, chemicals)

Indirect impacts to fauna may occur as a result of changes in noise, vibration, the introduction of night lighting and dust. Fauna species most susceptible to indirect impacts from construction noise and vibration and night lighting would include nocturnal species such as diurnal and nocturnal birds and bats, and other nocturnal mammals.

Given the existing noise environment for the project is characterised by high levels of road traffic noise (refer to Chapter 12 (Noise and vibration) for additional detail), construction noise and vibration is unlikely to have a considerable impact on diurnal and nocturnal fauna. Environmental management measures to minimise and manage construction noise and vibration are described in Section 12.4 of the EIS, as revised in **Chapter 8** (Revised environmental management measures) of this report.

Impacts to fauna during construction as a result of lighting are expected to be minor and temporary and would not significantly impact fauna within the biodiversity study area. Management measures to manage lighting are described in Chapter 14 of the EIS, as revised in **Chapter 8** (Revised environmental management measures) of this report.

Dust deposition on vegetation affects fauna that use these plants as a source of food or habitat. Impacts to biodiversity as a result of construction dust are expected to be minor and temporary and with the implementation of the revised environmental management measures outlined in **Chapter 8** of this report, would not significantly impact fauna within the biodiversity study area. Management measures to manage construction dust are described in Chapter 10 of the EIS as revised in **Chapter 8** (Revised environmental management measures) of this report.

Increased noise pollution

The project has the potential to result in indirect impacts on fauna caused by noise during construction. This is particularly the case given that some construction activities would occur during the day and night and would not be restricted to standard hours.

Indirect impacts on biodiversity may also result from changes in noise levels or lighting during operation. In general, noise is unlikely to have a substantial adverse effect on the diurnal and nocturnal threatened birds and mammals that may occur within the study area from time to time, because these types of indirect impacts are already widespread within the study area, and any exacerbation of these impacts would be limited by the proposed management measures.

The threatened species most at risk from noise is the Green and Golden Bell Frog. This is because the Arncliffe construction compound would be operational 24 hours during construction and the impacts of noise, dust and vibration are expected to continuously occur during this time.

Project specific measures to mitigate and minimise the indirect impacts to the Green and Golden Bell Frogs would be provided in the proposed Green and Golden Bell Frog Plan of Management (refer to **Chapter 8** of this report). Measures to limit noise impacts would include:

- Use of three metre temporary noise barriers along the northern, western and southern boundary of the construction zone
- Use of a non-acoustic shed for some construction activities in the construction zone adjacent to the Arncliffe construction compound to minimise noise impacts near the Green and Golden Bell Frog breeding ponds (known as the RTA ponds).

Reduction in viable habitat

The project would result in clearing of vegetation which would impact on existing habitat values. The project was designed with the aim of avoiding impacts to known areas of ecological sensitivity, where feasible. The project has avoided impacts to high quality vegetation and a vegetated riparian corridor in the Wolli Creek Valley, a small area of Sydney Turpentine Ironbark Forest in Kingsgrove, a Grey-headed Flying Fox camp and habitat at Turella and areas of native coastal reedland and mangroves at the confluence of Wolli Creek and the Cooks River.

Of the 3.31 hectares of native vegetation clearing to be undertaken for the project, less than half (1.4 hectares) is classified as a threatened vegetation community. Impacts to threatened vegetation would be offset in accordance with the FBA. Additional information regarding the biodiversity offsets strategy for the project is provided in Section 21 and Appendix T (Biodiversity Offset Strategy) of the EIS.

The remainder of the clearing would be in planted vegetation or small patches of remnant native vegetation. While these areas add to green spaces, the species themselves are not significant in terms of biodiversity value. Where possible these areas would be replanted and landscaped at the completion of construction.

The project would result in permanent removal or lopping of up to eight hollow bearing trees. The hollows present were of low quality and unlikely to be suitable for many hollow dependent fauna. As noted in Sections 6.6.1 and Chapter 7 of the Biodiversity Assessment Report for the project (Appendix S of the EIS), the loss of hollow-bearing trees resulting from the project would be managed through the installation of nest boxes in accordance with Roads and Maritime's Biodiversity Guidelines (RTA, 2011).

Impacts to fauna, including fauna in Sydney Park

Many of the species mentioned in the issue description above are not threatened and therefore do not require further assessment.

During the construction of the project, fauna injury or mortality may occur as a result of vegetation clearing or direct collision with vehicles and equipment within the construction site. Although some mobile species may be able to move away quickly and easily such as some birds, other less mobile species, or those which have high fidelity with their home range, may be slower to move away or may not relocate at all, potentially resulting in injury or mortality of the individual.

Although the project may potentially result in some injury or mortality of fauna species, the project is unlikely to cause a substantial increase in fauna injury or mortality incidents as the majority of the project alignment occurs underground. Where the alignment transitions from above to below ground the surrounding land is urbanised and represents a low risk of the presence of sensitive or threatened species.

Prior to vegetation clearance for the project pre-clearance activities would be carried out in accordance with Guide 1 Pre-clearing process of Roads and Maritime's Biodiversity Guidelines (RTA, 2011). Pre-clearing surveys would be undertaken by a suitably qualified ecologist to identify the presence of:

- Hollow-bearing trees
- Threatened flora and fauna.

Removal of vegetation from the existing noise mound in Kingsgrove

Vegetation along the noise mound at in Kingsgrove is classified as Urban exotic and native and clearance of this vegetation would not result in a significant impact to bird habitat. The vegetation removed would be a small proportion of the available habitat in the locality of the projects. Replanting of vegetation in this area would result in similar habitat and foraging opportunity to what is there now.

The biodiversity assessment report identified that the Glossy Black Cockatoo was unlikely to occur in the study area as the habitat is unlikely to be suitable. As such, any impact on Glossy Black Cockatoo populations is considered unlikely.

Issue description – impacts on the Grey-headed Flying Fox

Submissions raised concerns that the project would impact upon Grey-headed Flying Fox populations at Wolli Creek Valley, particularly via the removal of habitat and foraging vegetation.

Response

No Grey-headed Flying Fox breeding or roosting habitat is located within the construction and operational footprint of the project. The closest Grey-headed Flying Fox camp is located about 500 metres north of the Bexley Road surface works.

Grey-headed Flying Foxes feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. They also forage in cultivated gardens and fruit crops. Native vegetation communities within the biodiversity study area (refer to **Section 21.2.2**) provide potential foraging habitat for the Grey-headed Flying Fox. No potential breeding or foraging habitat is located within the biodiversity study area.

Given the distance from the nearest camp and the lack of potential breeding or foraging habitat in the biodiversity study area, the project is not anticipated to have a direct or indirect impact on Grey-headed Flying Fox populations.

Issue description – impact of the project on endangered ecological communities

Submissions raised concerns regarding the impact of the project on endangered ecological communities. Particular issues raised were:

- Losses to endangered ecosystems in the vicinity of Wolli Creek Valley including:
  - Impacts on Turpentine Iron Bark Forest
  - Impacts on Cooks River Clay Plain Scrub Forest.

Response

Turpentine Iron Bark Forest was identified within the study area. However, the project would not impact on Turpentine Iron Bark Forest.

The project would require clearance of around 1.4 hectares of Cooks River Castlereagh Ironbark Forest (formerly Cooks River Clay Plain Scrub Forest) located within and adjacent to the Kingsgrove North construction compound (C1) within Beverly Grove Park.

A detailed assessment of the significance of clearing up to 1.4 hectares of Cooks River Castlereagh Ironbark Forest is presented in Appendix S of the EIS. The assessment of significance against the EPBC Act significant impact criteria (Commonwealth Department of the Environment, 2015) determined that despite the provision of mitigation measures, there is likely to be a significant impact on this endangered ecological community. This reflects the limited remaining areas of this community within the Sydney Basin bioregion and its status as a critically endangered ecological community under the EPBC Act and as an endangered ecological community under the TSC Act.

Impacts to the Cooks River Castlereagh Ironbark Forest endangered ecological community (EEC) would be offset in accordance with the FBA. Additional information regarding the biodiversity offsets

strategy for the project is provided in Section 21 and Appendix T (Biodiversity Offset Strategy) of the EIS.

The project would not require clearance of other threatened ecological communities within the Wolli Creek Valley.

Issue description – obligations under existing legislation to protect threatened and endangered species and ecological communities

Submissions suggested that the project should not proceed due to a need to uphold legal obligations surrounding the protection of the Green and Golden Bell Frog and endangered ecological communities.

Response

Roads and Maritime acknowledges obligations under threatened species legislation, including the Threatened Species Conservation Act 1995 (NSW) and the Environment Protection and Biodiversity Conservation Act 1999 (Cth). The project has been designed taking into account these obligations, and the EIS for the project has been prepared in accordance with applicable threatened species legislation, assessment policies and guidelines. This has included a detailed assessment of potential impacts on the Green and Golden Bell Frog and endangered ecological communities. The project would also be constructed and operated in accordance with applicable threatened species legislation, and the conditions of any approval granted by the Minister for Planning and Environment.

5.20.3 Groundwater dependent ecosystems

Ten submitters raised issues regarding impacts to groundwater dependent ecosystems

Issue description – impact of groundwater drawdown on vegetation

Submissions raised concern that depletion in groundwater may have impacts on overlying vegetation communities and associated fauna assemblages. Submissions specifically mentioned:

- Impacts of groundwater drawdown on Cooks River Castlereagh Ironbark Forest
- Impacts of groundwater drawdown on the ongoing health of vegetation in Stotts Reserve at Bexley North due to ground water dependence.

Response

General impacts of drawdown on vegetation

The maximum amount of groundwater drawdown is expected to be about five to ten metres. Drawdown would be the greatest directly above the main alignment tunnels, and would decrease towards the drawdown boundary. Five Groundwater Dependent Ecosystems (GDEs) (including the Cooks River and the Cooks River Castlereagh Ironbark Forest) have the potential to be impacted as a result of groundwater drawdown. A summary of GDEs potentially impacted by the project is provided in Table 21-10 in Chapter 21 of the EIS.

Of the five GDE's potentially impacted by the project, four have been assessed as a low significance of impact and one (the Cooks River Castlereagh Ironbark Forest) is identified as being moderately impacted.

Cooks River Castlereagh Ironbark Forest

1.80 hectares of Cooks River Castlereagh Ironbark Forest along northern edge of highway and south of golf course includes Melaleuca and Casuarina in the forest suggesting a possible groundwater link. Potential impacts from drawdown have been assessed as moderate. A lowering of the groundwater table may stress this community. However, this area is likely to be cleared during construction of the project.

Stotts Reserve at Bexley North

Stotts Reserve at Bexley North is outside of the construction footprint but within the groundwater drawdown extent as it is located directly above the main alignment tunnels. The reserve contains

around 3.5 hectares of Coastal Sandstone Ridgetop Woodland which has a moderate to high potential to be dependent on groundwater.

Groundwater drawdown in this area as a result of the project could be up to 10 metres. Woodland in the reserve probably uses soil moisture and surface water during periods of normal rainfall, and groundwater during prolonged dry periods. The significance of this impact has been assessed as low. Under prolonged dry conditions, the vegetation at Stotts Reserve may show signs of stress. However, the community should recover with sufficient rainfall.

5.20.4 Aquatic environment and changes to hydrology

Eight submitters raised issues regarding changes in hydrology and impacts to aquatic environments.

Issue description – impact of the project on wetland ecosystems

Submissions raised concern regarding impacts to wetland environments located nearby the project footprint, including at:

- Sydney Park
- Rockdale Wetlands Corridor
- Cooks River
- Wolli Creek (including Mangroves).

Response

No wetlands would be directly impacted by construction of the project. There are no SEPP 14 wetlands in the study area. Artificial waterbodies are scattered across the study area as detention basins and ponds. Some of these artificial wetlands are known to support a variety of wetland fauna, including the Green and Golden Bell Frog at Arncliffe. Impacts of the project on native fauna have been detailed in Chapter 21 and Appendix S (Biodiversity Assessment Report) of the EIS.

Significant impacts to the biodiversity of the Sydney Park stormwater harvesting ponds are not anticipated.

Impacts from the project on the Rockdale Wetlands are not anticipated.

Potential impacts on waterways including Wolli Creek and Cooks River and associated vegetation communities from the project have been assessed in Chapter 16 soil and water and Chapter 21 biodiversity, in the EIS.

The EIS concluded that there was no riparian vegetation that would be impacted by the project.

The operational water quality impacts from the above ground permanent infrastructure associated with the project are assessed in Section 16.3.2 of the EIS. These impacts would be predominantly due to an increase in runoff from the increase of impervious area and the related mobilisation of pollutants from the carriageway. Although the project would result in an increase in impervious surface areas, current provisions are sufficient to meet the treatment targets for most catchments, and stormwater treatment in some catchments exceeds the treatment requirements, such that the project overall would result in less pollutants being delivered to local watercourses

Additional pollutant loads generated by surface runoff would be managed through a range of stormwater treatment measures such as gross pollutant traps, constructed wetlands, bioretention systems, water quality basins and proprietary treatment devices.

The EIS identified the Cooks River as potentially being a groundwater dependent ecosystem. Some of this groundwater may flow underneath the Kogarah Golf Course at Arncliffe, which could be intercepted during tunnelling. Although the Cooks River is highly likely to receive groundwater, there are no known ecosystem components which would be significantly impacted by a reduction in groundwater as a result of groundwater interception from tunnelling.

5.20.5 Indirect and other impacts

Seven submitters raised issues regarding indirect and other impacts to biodiversity.

Issue description – impacts of climate change on biodiversity

Submissions raised concern that the project would contribute to greenhouse gas emissions, and therefore would indirectly contribute to biodiversity losses via to climate change.

Response

During construction, machinery and production and transport of materials would emit carbon-dioxide into the atmosphere, which is known to increase greenhouse gases responsible for climate change. However, the results of the greenhouse gas assessment 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 greenhouse gas emissions being generated by road users, as reduced congestion and stop-start driving reduces the fuel used by vehicles. Further detail can be found in Chapter 22 (Greenhouse gas) of the EIS.

The risk of the project exacerbating the impacts of climate change on biodiversity is considered to be low.

5.20.6 New information

No issues raised in community submissions were categorised under 'new information'.

5.20.7 Level and quality of assessment

1,166 submitters raised issues regarding the level and quality of biodiversity assessment undertaken.

Issue description – level and quality of the biodiversity impact assessment

Submissions raised concerns regarding the adequacy and quality of the biodiversity impact assessment.

Response

The NSW Biodiversity Offsets Policy for Major Projects was developed by the NSW OEH and introduced in 2014. As part of a major project application under the *Environmental Planning and Assessment Act 1979* (EP&A), a proponent must prepare an EIS that addresses the Secretary's Environmental Assessment Requirements (SEARs) provided by the NSW Department of Planning & Environment.

Under the NSW Biodiversity Offsets Policy, the SEARs require the FBA to be applied to assess impacts on biodiversity. 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.

In its submission on the EIS for the project, OEH notes that the Biodiversity Assessment Report correctly applied the FBA and raised no issues in relation to the way in which the impact assessment was completed or the conclusions drawn as to the significance of likely impacts.

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 EPBC Act still requires proponents to determine whether significant impacts are likely on all EPBC listed threatened species and ecological communities in accordance with national guidelines.

The biodiversity assessment for the project has been carried out in accordance with the requirements of the following State and Commonwealth Acts, policies, guidelines and approved conservation advice:

- The NSW EP&A Act
- The Commonwealth EPBC Act

- *Framework for Biodiversity Assessment* (NSW Office of Environment and Heritage (OEH), 2014)
- NSW Biodiversity Offsets Policy for Major Projects (OEH, 2014)
- Draft Policy and Guidelines for Fish Habitat Conservation and Management (NSW Department of Primary Industries (DPI), 2013)
- Guidelines for preparing Assessment Documentation relevant to the Environment Protection and Biodiversity Conservation Act 1999 – WestConnex New M5 Project (EPBC 2015/7520)
- Commonwealth Approved Listing Advice for Turpentine-Ironbark Forest of the Sydney Basin Bioregion (Threatened Species Scientific Committee (TSSC) 2005)
- Commonwealth Approved Conservation Advice for Turpentine Ironbark Forest in the Sydney Basin Bioregion (TSSC 2014a)
- Commonwealth Approved Conservation Advice (including listing advice) for Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion. (TSSC 2015)
- Commonwealth Significant Impact Guidelines for the Green and Golden Bell Frog (2009).
- Commonwealth Approved Conservation Advice for Litoria aurea (Green and Golden Bell Frog) (TSSC 2014b)
- Risk Assessment Guidelines for Groundwater Dependent Ecosystems (DPI 2012).

In addition, continued consultation with OEH and the Commonwealth Department of the Environment has been carried out throughout the preparation of the EIS for the project regarding the assessment methodology, the results of the biodiversity assessment and offsetting requirements under relevant legislation and policy. Additional detail regarding consultation is provided in Chapter 7 of the EIS.

Issues description – assessment of cumulative biodiversity impacts

Submissions stated that the EIS fails to adequately assess impacts to biodiversity across WestConnex stages, including the M4 widening, King Georges Interchange, M5 duplicate and the M4–M5 Link project.

Response

WestConnex projects such as the King Georges Road Interchange Upgrade project and the future M4-M5 link (subject to planning approval) would result in removal of planted vegetation and fauna habitats. The M4 East project would involve the removal of small patches of highly fragmented planted vegetation.

The King Georges Road Interchange Upgrade project includes the removal of a small area (0.01 hectares) of Cook River / Castlereagh Ironbark Forest in the Sydney Basin endangered ecological community, the removal of low quality habitat (3.23 hectares) with potential food habitat for the Grey headed flying fox (Pteropus poliocephalus) and removal of nine affected Downy Wattle (Acacia pubescens) individuals. Given the small areas, poor condition and low site value scores, impacts on biodiversity would be minor for the King Georges Road Interchange project.

No significant cumulative impacts to the habitat for the Green and Golden Bell Frog (Litoria aurea) are expected to occur as a result of other WestConnex projects. Overall these projects and other developments would result in some further loss of habitat from an already modified environment with only limited natural biodiversity value. Cumulative impacts to biodiversity are therefore unlikely to be significant.

5.20.8 Biodiversity management and offsets

112 submitters raised issues regarding biodiversity management and offsets.

Issue description – management of impacts to Cooks River Castlereagh Ironbark Forest

Submissions raised the following concerns regarding the mitigation for impacts on the Cooks River Castlereagh Ironbark Forest vegetation community:

- There is conflicting information on possible mitigation strategies
- Many strategies are pushed out into the future and no formal offsets have been identified in the EIS to compensate for the removal
- Concerns regarding the availability of suitable offsets in proximity to the site.

Response

The EIS proposes a number of mitigation measures to manage impacts of the project on biodiversity. For clarity, the mitigation measures specific to Cooks River Castlereagh Ironbark Forest are as follows:

- Preparation of a flora and fauna management plan to manage impacts of the project on biodiversity, including on the remaining areas of Cooks River Castlereagh Ironbark Forest within Beverly Grove Park
- Minimisation of the disturbance and clearance of established vegetation as far as practical
- Offset of unavoidable impacts in accordance with the FBA and the Biodiversity Offset Strategy provided in Appendix T of the EIS
- Identification of exclusion zones to protect against accidental vegetation damage
- Management of weed spread in accordance with Guide 6 of the Biodiversity Guidelines. A risk assessment process would be used for each site to determine the need to clean machinery prior to entering the construction compound sites. A weed management plan would be prepared as part of the flora and fauna management plan
- Identification of pathogens as part of pre-clearing inspections. A risk assessment process would be used for each site to determine the need to clean machinery prior to entering the construction compound sites. In the event that pathogens are identified within the construction footprint, appropriate mitigation measures would be identified and implemented in accordance with Guide 7 of the Biodiversity Guidelines.

A Biodiversity Offset Strategy has been prepared for the project and is included in Appendix T of the EIS. The Biodiversity Offset Strategy:

- Outlines the offsets required for unavoidable biodiversity impacts, that is, those residual impacts which remain after impacts have been avoided, minimised and mitigated to the extent that is reasonable and feasible
- Identifies where appropriate offsets could be obtained for the project and supplementary measures that can be implemented where the required offsets are unavailable.

It is acknowledged that formal offsets are yet to be confirmed. However, Roads and Maritime is committed to providing a Biodiversity Offset Strategy that offsets the impacts of the proposed development consistent with the requirements of the FBA and Major Projects Offsets Policy.

Issue description – validity of mitigation for impacts to the Green and Golden Bell Frog

Submissions questioned the biodiversity management and offset plans for the Green and Golden Bell Frog. Specific mention was given to the following concerns:

- What measures have been taken to ensure minimal disturbance to frog habitat
- What offset measures are proposed
- Concerns that the proposed protective and mitigation measures such as frog exclusion fencing, translocation and captive breeding are inadequate and high risk
- Perception that the Green and Golden Bell Frog population at the Kogarah Golf Course cannot be maintained after the New M5 construction is completed.

Response

The biodiversity assessment and the identification of appropriate biodiversity offsets for the project has been undertaken in accordance with the requirements of the NSW Biodiversity Offsets Policy for Major Projects (the biodiversity offsets policy) (OEH, 2014c) and the FBA (OEH, 2014b).

The Bilateral Agreement relating to environmental assessment (February 2015) between the Commonwealth Government and the NSW Government, has endorsed the FBA as providing an appropriate basis for undertaking biodiversity assessment, including Commonwealth listed threatened species and ecological communities such as the Green and Golden Bell Frog.

Minimal disturbance

Unlike early design and motorway alignment alternatives identified for the project, such as the Southern alignment option that would have included a surface connection from Arncliffe to St Peters (refer to Section 4.3.1 and Figure 4-3 of the EIS), the majority of the project would be underground. This means that surface disturbance is limited to where the tunnels emerge or where at-surface infrastructure is required to support the construction and operation of the project. By generally building underground, the project avoids and minimises negative impacts on the environment, including the Green and Golden Bell Frog population at Arncliffe.

To facilitate the construction and to satisfy operational tunnel ventilation requirements, permanent infrastructure and construction activities are required to occur at the surface, ideally at the tunnel mid-point in addition to the tunnel portals. The publicly-owned areas of the Kogarah Golf Course were identified for the Arncliffe surface facilities because these areas consist of large parcels of publicly-owned land, avoiding the need for acquisition of private property, that have the potential for immediate site access to/from Marsh Street.

The project has been designed to avoid direct impacts to the primary breeding habitat of the Green and Golden Bell Frog population, which are the RTA ponds. Further, the following design refinements were undertaken to reduce the worst case disturbance footprint and impacts on the Green and Golden Bell Frog:

- Reduction in both the construction and the operation footprint to reduce impacts on foraging habitat
- Provision of a buffer/ exclusion zone of around 32 metres between the disturbance footprint and the Green and Golden Bell Frog breeding ponds (the RTA Ponds), and provision of a corridor to allow frogs to access the remaining areas of the golf course.

The Green and Golden Bell Frog Management Plan (Appendix K of the Biodiversity Assessment Report in the EIS) sets out the measures that would be implemented to ensure minimal disturbance to Green and Golden Bell Frog habitat during construction and operation. These measures are as follows:

- Construction management measures:
  - Clear delineation of the construction boundary to ensure that the minimum area of take is adopted
  - Establishment of a physical barrier, using frog exclusion fencing between all construction works existing RTA Ponds and reminder of the Golf Course, to clearly separate frog habitat from the construction zone
  - Establishment of appropriate sediment and erosion control to prevent silt, sediments, spills and other contaminants from reducing water quality in frog habitat
  - Use of directional lighting in the vicinity of the transparent frog exclusion fence. Directional lighting should aim to reduce night time light spill onto the RTA ponds
  - Management of dust on site to reduce impacts to adjacent Green and Golden Bell Frog habitat

- Careful use of herbicides and other chemicals to avoid use near the RTA ponds and within the enhanced frog habitat area. If herbicides are to be used within the construction zone, spray drift must not be able to reach aquatic habitat. This applies to herbicides in solution in surface water run-off
- Re-instatement of all habitat that was temporarily impacted from the construction activities within the Arncliffe surface works area.

- Habitat enhancement and management within adjacent habitat including the RTA ponds
- Habitat creation at Marsh Street and the establishment of a captive breeding population.

Offset measures proposed

The impact of the project on the Green and Golden Bell Frog population would be offset by purchasing 203 biodiversity credits as part of the Biobanking Scheme. At this stage, prospects for buying the necessary credits are good with many landholders identified as interested in participating in the Biobanking scheme. In addition, a Biobanking agreement (supported by the annual payments from the BioBanking Trust Fund) could provide the basis for the secure long term funding for the management of any recreated habitat at Marsh Street (refer to **Chapter 7** of this report). Active management is essential to the ongoing persistence of this species at Arncliffe due to the ongoing threats of plague minnow (*Gambusia holbrooki*), weed infestation and disease.

Proposed protective and mitigation measures

The Biodiversity Assessment Report (Appendix S of the EIS) proposes several measures to minimise impacts to the frogs at the RTA ponds and the Kogarah Golf Course. The methods proposed (i.e. pre-clearance survey and frog exclusion fencing from the construction area) would be highly effective in minimising impacts to the RTA ponds and frogs that may be dispersed across the golf course.

The assessment rated some measures as likely to have low to moderate success (i.e. captive breeding and translocation) based on experience in previous projects (refer to Table 22 of the Biodiversity Assessment Report). However, lessons learned from previous experience in employing these measures on other projects would improve the success of employing these measures on the New M5. Such lessons include not releasing tadpoles and inclusion of over-wintering habitat at the release site.

The primary risks associated with frog exclusion fencing are associated with the failure of fences (such as holes and other breaches). These risks would be managed during construction by regular visual inspection, including daily pre-start checklists, mandatory reporting of holes in fences and immediate fence repairs.

The risk of translocation primarily relates to the mortality of translocated individuals. On the New M5 project, this risk would be managed by:

- Engaging a recognised frog expert with particular long term experience in handling Green and Golden Bell Frogs
- Adhering to well established hygiene and translocation (transport) protocols to limit the risk of spreading the chytrid fungus disease. These protocols are set out in the Habitat Creation and Captive Breeding Plan for the Green and Golden Bell Frog at Arncliffe (**Appendix B** of this report). This plan has been independently reviewed by two experts.

Other risks would include mortality once individuals are released back into the wild. Previous experience with these types of works from other projects have indicated that success would be increased by releasing individuals older than tadpoles (e.g. tadpoles with hind limb buds) and the provision of over-winter habitat. Successful introductions have been achieved by following these types of protocols at Woonona and Kooragang Island.

Risks for captive breeding include, lack of breeding success and mortality of captive frogs. A lack of breeding success would be managed by maximising the genetic diversity of the proposed breeding stock through ensuring more than three parent combinations. There would also be potential to improve success through outcrossing with other Green and Golden Bell Frog populations. This is because it has been previously demonstrated that the Arncliffe population is not a different species or sub-species from other Green and Golden Bell Frog populations.

Mortality of captive frogs would be managed by implementing leading practice animal husbandry guided by species experts. Captive breeding programs for this species have been successful in the past and lessons from these programs would be considered.

Longer term prospects of the population would rely on intensive habitat management that currently occurs at the RTA ponds. This includes flushing of ponds with salt to minimise Chytrid fungus, altering water levels to manage Plague Minnow, manipulating vegetation in the ponds to improve basking habitat and general management of the RTA ponds area. These management actions are expected to continue in line with the conditions of approval for the M4 East Motorway project. With the provision of supplementary feeding and additional stepping stone habitat ponds during construction, it is expected the population would remain extant.

Ongoing maintenance of the population

As part of the original M5 East project, Roads and Maritime Services provided breeding ponds for the Green and Golden Bell Frog on government owned land occupied by Kogarah Golf Club in Arncliffe. It is important to note that the current population requires constant management and that Roads and Maritime has managed these ponds for more than a decade to provide habitat for the Green and Golden Bell Frog. Management measures proposed as part of the project would continue the active management of the Arncliffe Green and Golden Bell Frog population.

Issue description – validity of offsets

Submissions raised concerns regarding the validity and effectiveness of the proposed offsets, including:

- Concerns were also raised that the appropriate management measures such as the BioBanking credits have not been considered in the Biodiversity Offset Strategy for the project
- Concern that the Biodiversity Banking and Offsets Scheme is not rigorous and does not provide adequate environmental protection
- Creating public gardens and playgrounds as offsets do not mitigate for environmental losses
- Offsets would not be 'like for like,' particular where used to mitigate impacts to bushland remnants and EECs
- The options available within the Biodiversity Offset Strategy are unsatisfactory and would not adequately replace the losses to the CRCIF.
- Offsets have been not been provided for the Smooth-barked Apple - Red Bloodwood - Sydney Peppermint health open forest on slopes of dry sandstone gullies of western and southern Sydney
- Offsets have not been provided for the Grey-Headed Flying-Fox with regards to the removal of foraging habitat.

Response

The NSW Biodiversity Offsets Policy for Major Projects 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 (EP&A), a proponent must prepare an EIS that addresses the Secretary's Environmental Assessment Requirements (SEARs) provided by the NSW Department of Planning & Environment. Under the NSW Biodiversity Offsets Policy, the SEARs require the FBA to be applied to assess impacts on biodiversity. 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. In its submission on the EIS for the project, OEH notes that the Biodiversity Assessment Report correctly applied the FBA and raised no issues in relation to the way in which the impact assessment was completed or the conclusions drawn as to the significance of likely impacts.

The Biodiversity Offset Strategy for the project is provided in Appendix T of the EIS and includes calculated Biobanking credits required to offset the residual, unavoidable impacts of the project. Offsets are required for:

- The Broad-leaved Ironbark-Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Bioregion (synonymous with the Cooks River / Castlereagh Ironbark Forest (CRCIF) endangered ecological community)
- The Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
- The Green and Golden Bell Frog.

Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney was identified as requiring an offset of one ecosystem credit. However, this plant community type is neither an endangered ecological community nor a critically endangered ecological Community under the TSC or EPBC Acts nor is it associated with threatened species habitat. Therefore, according to the NSW Biodiversity Offsets Policy for Major Projects and the FBA, this plant community type does not require an offset to be determined.

An assessment of the impacts of the project on the Grey-headed Flying fox against the EPBC significant impact criteria was undertaken as part of the Technical Working Paper: Biodiversity Assessment Report (refer to Appendix F of that technical working paper). The assessment against the significant impact criteria concluded that the project would not affect known breeding habitat and would only impact on a relatively small area of potential foraging habitat for this highly mobile species. No important populations would be isolated or fragmented and the life cycle of this species is not likely to be adversely affected. Therefore, the project is not likely to have a significant impact on this species and no offset credits are required.

Biodiversity offsets are required to be provided on a 'like for like' basis, except in limited, exceptional circumstances. In such cases – for example, where all reasonable endeavours have been made to secure a 'like for like' offset, but an appropriate offset cannot be secured – an alternative offset may be considered, but only where the alternative offset type has undergone equal or greater levels of clearing than the offset being initially sought and where the relevant vegetation community is not listed under the EPBC Act.

Public gardens and playgrounds would typically not form an appropriate biodiversity offset and would not be accepted as an adequate offset approach. Although the project includes landscaping, rehabilitation and provision of public open space, these components of the project would not be counted as part of the required biodiversity offsets.

Issue description – mitigation for vegetation removal

Submissions raised concerns that the project does not propose adequate revegetation to replace the loss of vegetation and habitats at Beverly Grove Park.

Response

The project would require clearance of around 1.4 hectares of Cooks River Castlereagh Ironbark Forest (formerly Cooks River Clay Plain Scrub Forest) located within and adjacent to the Kingsgrove North construction compound (C1) within Beverly Grove Park.

Impacts to the Cooks River Castlereagh Ironbark Forest endangered ecological community would be offset in accordance with the FBA. Additional information regarding the biodiversity offsets strategy for the project is provided in Section 21 and Appendix T (Biodiversity Offset Strategy) of the EIS.

Following completion of the project, revegetation at Beverly Grove Park would include local species from existing and adjoining plant communities and would assist in protecting and recovering local biodiversity.

Issue description – mitigation for impacts to Grey-headed Flying Fox habitat

Submissions raised concerns that there is no detail concerning mitigation of impacts associated with the removal of foraging habitat for the Grey-headed Flying Fox.

Response

No potential breeding or roosting habitat is located within the biodiversity study area. Some of the vegetation that would be cleared for the project may be foraging habitat for the Grey-headed Flying Fox. The biodiversity assessment concluded that direct impacts to this foraging habitat are unlikely to present a significant adverse impact to this species given the context of the available foraging habitat in the region. Consequently, specific mitigation measures are not required.

Issue description – trees cleared

Arncliffe School requested that a specific quota is set for new trees and other planting in the community to replace any plants and trees cleared during construction.

Submissions requested that trees are replaced on a one to one basis.

Response

Landscaping and revegetation as the part of the project would include planting of around 2,800 mature trees and about 4,000 juvenile trees (as part of massed planting areas). The total area to be landscaped and replanted would be around 17.5 hectares. This would result in a net gain of around 6.7 hectares of vegetated and landscaped open space as a result of the project.

Issue description – management of Sydney Park biodiversity

Submissions requested that management measures are provided to ensure impacts to the biodiversity of Sydney Park are managed.

Response

Mitigation and management measures would be implemented to minimise impacts to biodiversity where feasible. These management measures are include in the revised environmental management measures in **Chapter 8** of this report.

Around the St Peters interchange and local road upgrades around 12 hectares would be landscaped with 1750 mature trees and 2000 trees as part of massed planting areas.

Management measures would be implemented in accordance with a Flora and Fauna Management Plan developed for the project.

5.20.9 Impacts to the Green and Golden Bell Frog

3,748 submitters raised issues regarding impacts to the Green and Golden Bell Frog.

Issue description – Concern regarding population health and viability

Submissions expressed concern regarding the ongoing viability of the Green and Golden Bell Frog population at Kogarah Golf Club due to the following reasons:

- The frogs would not withstand relocation
- Habitat removal and / or fragmentation
- The frogs would not survive the operation of the project
- Decommissioning of RMS breeding ponds (known as the RTA ponds).

Response

The biodiversity impacts of the project have been assessed in accordance with the requirements of the FBA, Biodiversity Offsets Policy for Major Projects and the SEARs issued for the project.

Appendix G of the Biodiversity Assessment Report (Appendix S of the EIS) considers the impact on the project to the Green and Golden Bell Frog population.

The current population is considered to have poor long term viability, irrespective of the construction of the New M5, without active intervention to manipulate water levels, to manage vegetation, predator control (Plague Minnow) and salt water flushing to manage chytrid fungus.

A Green and Golden Bell Frog Plan of Management was prepared as part of the EIS (Appendix K of the Biodiversity Assessment Report). The development of the Green and Golden Bell Frog Plan of Management takes into consideration lessons learned from other projects.

The management and mitigation measures included in this plan hare presented in Section 21.3.1 of the EIS. These include preparation of habitat creation and captive breeding plans which is provided in Appendix B of this report. The habitat creation and captive breeding plans have been independently reviewed by two experts, not associated with the project.

A plan of management for the Green and Golden Bell Frog would also be prepared and included in the Construction Environment Management Plan for the project.

The RTA ponds are managed by Roads and Maritime in line with the conditions of approval for the M5 East Motorway project. The project would not directly impact on the RTA ponds, and would not involve the decommissioning of these ponds.

Issue description – suitability of the RTA ponds as a breeding habitat

Submissions raised concerns regarding the ongoing suitability of the RTA ponds to provide habitat for the green and golden bell frog during the construction and operation of the project

- Too old
- Exclusion fencing restricting access
- Not at ideal optimum breeding temperature
- Nearby vegetation not suitable for foraging.

Response

The RTA ponds are managed by Roads and Maritime in line with the conditions of approval for the M5 East Motorway project. The project would not directly impact on the RTA ponds, and would not impact on the ongoing management of these ponds.

Issue description – impacts of construction on the Green and Golden Bell Frog

Submissions raised concern that Green and Golden Bell Frogs would be affected by the construction of the project, including by impacts associated with:

- Dust
- Noise and vibration
- Artificial lighting
- Artificial shading.

Response

Potential impacts from construction of the project on the Green and Golden Bell Frog have been assessed in Section 21.3.1 of the EIS and Appendix T (Biodiversity Assessment Report).

The project would remove up to 7.82 hectares of foraging, dispersal and sheltering habitat for the Arncliffe key population at Kogarah Golf Course. The breeding habitat provided by the existing RTA Ponds would not be directly disturbed by the project, and a buffer / exclusion zone of around 32 metres would be provided between the RTA Ponds and the Arncliffe construction compound.

Dust has the potential to be generated during construction as a result of clearing, disturbance of soils, movement of machinery. Dust that settles on vegetation accumulates on leaf surfaces and reduces essential photochemical processes, decreasing plant health and reducing habitat quality. Dust deposition on vegetation also affects fauna that use these plants as a source of food or habitat. Impacts to threatened fauna as a result of construction dust are expected to be minor and temporary and would not significantly impact fauna within the biodiversity study area.

Given the existing noise environment for the project is characterised by high levels of road traffic noise, construction noise and vibration is unlikely to have a considerable impact on diurnal and

nocturnal fauna. The Green and Golden Bell Frog Plan of Management for the project includes specific mitigation and management measures to minimise indirect noise and vibration impacts at the RTA Ponds, including the installation of frog exclusion fencing along the boundary.

Construction lighting could affect sleeping patterns of nocturnal species and may also discourage prey species. Impacts to fauna during construction as a result of lighting are expected to be minor and temporary and would not significantly impact fauna within the biodiversity study area. The Green and Golden Bell Frog Plan of Management for the project would include specific mitigation and management measures to minimise indirect lighting impacts at the RTA Ponds, including the use of low sodium and / or directional lighting to avoid light spill into the RTA Ponds.

5.20.10 Impacts to Cooks River Castlereagh Ironbark Forest

3,098 submitters raised issues regarding impacts to Cooks River Castlereagh Ironbark Forest.

Issue description – impacts to vegetation within the Cooks River Castlereagh Ironbark Forest Endangered Ecological Community

Submissions raised concern regarding the removal of and impacts to Cooks River Castlereagh Ironbark Forest.

Response

The project was designed with the aim of avoiding impacts to known areas of ecological sensitivity, where feasible. However, some impacts on areas of ecological sensitivity were unavoidable due to the required footprint of the project. These unavoidable impacts would include impacts to threatened ecological communities and threatened species. Notwithstanding, opportunities to avoid and minimise the extent of vegetation clearing would continue to be considered during detailed design.

The study area for the biodiversity assessment as described in Chapter 21 of the EIS comprised the project construction and operational footprint for the project and conservatively assumed that all land within these footprints would require clearance to accommodate the project. The biodiversity assessment therefore has been undertaken using a 'worst case' scenario assessment.

The project would require the removal of 1.4 hectares of Cooks River Ironbark Forest at the western surface works, which is listed as an endangered ecological community under the TSC Act and EPBC Act. The Cooks River Castlereagh Ironbark Forest requiring clearance is equivalent to around 0.1 per cent of the estimated remaining remanent area of this community within the Sydney Basin Bioregion.

The assessment of significance of this vegetation clearance against the EPBC Act significant impact criteria (Commonwealth Department of the Environment, 2015) determined that despite the provision of mitigation measures, there is likely to be a significant impact on this endangered ecological community. This reflects the limited remaining areas of this community within the Sydney Basin bioregion.

In its submission on the EIS for the project, OEH stated that the impact of the project on Cooks River Castlereagh Ironbark Forest EEC would be acceptable in the context of the remaining vegetation present.

Issue description – impacts to genetic diversity

Submissions expressed concern that Cooks River Castlereagh Ironbark Forest would be impacted by a loss of genetic diversity.

Response

The project is anticipated to require the clearing of 1.4 hectares of Cooks River Castlereagh Ironbark Forest, which is equivalent to less than 0.1 per cent of the estimated remaining remnant area of this community within the Sydney Basin Bioregion. As such it is not anticipated that the project would significantly impact the generic diversity or prevalence of this vegetation community.

Issue description – critical threshold for patch of forest

Submissions raised concerns that the project would reduce the patch size of the remaining Cooks River Castlereagh Ironbark Forest (CRCIF) below the 0.5 hectare critical threshold for a patch of

forest. This would result in the remaining bushland no longer being considered CRCIF and the bushland would no longer be entitled to protection.

Response

The project would involve the removal of 1.4 hectares of Cooks River Castlereagh Ironbark Forest, leaving a patch of around 0.4 hectares, which is below the 0.5 hectare patch threshold. The Technical Working Paper: Biodiversity Assessment Report recognises that vegetation removal as a result of the project would inhibit the recovery of the remaining patch of this vegetation community.

The residual patch would continue to be managed for conservation by Roads and Maritime in accordance with a management plan and the conditions of any approval granted to the project. An offset package has been developed for the project, in accordance with the requirements of the Framework for Biodiversity Assessment.

Issue description – state of the Cooks River Castlereagh Ironbark Forest

Submission noted that locals and visitors to the area attest to the healthy state of the Cooks River Castlereagh Ironbark Forest. This contradicts the assessment of the population having low long-term viability.

Response

The Cooks River / Castlereagh Ironbark Forest (CRCIF) endangered ecological community to be impacted by the project is in generally good condition. However, as detailed in Appendix T (Biodiversity Assessment Report) of the EIS, the patch of this vegetation is relatively young regrowth, with the upper stratum largely absent. The understorey is dominated by regenerating mid and overstorey species.

Although the patch of this vegetation is in a relatively good, albeit regenerating, condition, it is unlikely to be viable in the longer term because the patch has:

- A highly modified structure and composition
- A high perimeter to area ratio
- No prospect of expanding into adjacent areas.

Without substantial effort and continuing management, this patch is unlikely to be viable in the long term. An offset package has been developed for the project, in accordance with the requirements of the FBA. This would include measures to compensate for the loss of Cooks River Castlereagh Ironbark Forest from construction of the project. This would require that all identified significant residual impacts on Cooks River Castlereagh Ironbark Forest are offset in accordance with the principles of the NSW Offset Policy for Major Projects.

5.20.11 Existing M5 East Motorway conditions of approval

2,211 submitters raised issues pertaining to previously issued conditions of approval for the M5 East motorway.

Issue description – Concern regarding the ongoing relevance of M5 East Motorway conditions of approval

Submissions noted conditions of approval relating to the protection of endangered flora and fauna that were issued during the development of the M5 East Motorway. Submissions raised concern that these historical conditions of approval would no longer be honoured during the construction of the New M5.

Submissions suggested that the project should not proceed due to a need to uphold legal obligations surrounding the protection of the Green and Golden Bell Frog and endangered ecological communities.

Response

Green and Golden Bell Frog

Conditions of approval for the M5 East Motorway incorporated conditions relevant to Green and Golden Bell Frog habitat at Arncliffe, including the requirement to create artificial habitat on RMS land within Kogarah Golf Course. A Plan of Management was required to be prepared and approved by the Director General of National Parks and Wildlife. The approved Plan of Management dealt with a variety of measures including frog monitoring, a captive breeding program and the construction of an alternative habitat primarily comprising ponds now known as the RTA ponds.

The Plan of Management also provided for management measures at an area referred to in the approved Plan of Management as the 'Marsh Street wetland'. These activities included the provision of a tunnel under the M5 East Motorway connecting the Marsh Street wetlands with the newly created RTA ponds on the Kogarah Golf Course.

The proposed management measures that would be undertaken for the Green and Golden Bell Frog habitat are explained in the Green and Golden Bell Frog Plan of Management (Biodiversity Assessment Report in Appendix S of the EIS) and the Green and Golden Bell Frog Habitat Creation and Breeding Plan in Appendix B of this report.

Enhancement of the foraging habitat for the Green and Golden Bell Frog using the RTA ponds would occur along with measures to protect the Green and Golden Bell Frog from harm arising from construction activities on the Kogarah Golf Course. These measures would be undertaken before or during construction and have been designed to ensure that the RTA ponds continue to provide habitat for the Green and Golden Bell Frog throughout the construction period of the project.

The Plan of Management for the New M5 project (in Appendix S of the EIS) also sets out strategies to create new, additional long term habitat on RMS land at Marsh Street supported by a captive breeding program. The provision of this additional habitat was recommended in the EIS, with the Plan of Management supporting the need for additional habitat.

Impacts on the Green and Golden Bell Frog from the project have been assessed as requiring offset measures as explained in Section 7 of the Biodiversity Assessment Report (in Appendix S of the EIS).

The ongoing efforts to create and maintain Green and Golden Bell Frog habitat at Marsh Street would be undertaken as part of the project. The Green and Golden Bell Frog habitat protections that are proposed for Marsh Street are an enhancement of the requirements of the M5 East Motorway approval, and thus would supersede and replace the requirements of the M5 East Motorway approval for the area south-west of the M5 East Motorway. Ongoing post-construction management activities within the RTA ponds including managing pest fish species and weeds would be unaffected by the project and would continue under the M5 East Motorway approval.

Cooks River Castlereagh Ironbark Forest Endangered Ecological Community at Beverly Grove

Impacts on vegetation on Roads and Maritime land at Beverly Grove, including the CRCIF EEC, were assessed as part of the approval process for the M5 East Motorway. The M5 East Motorway approval required that the remaining vegetation on the Roads and Maritime lands following construction be managed in accordance with a management plan. A Management Plan was subsequently prepared and has been implemented by Roads and Maritime since that approval was granted.

Approximately 1.4 ha of CRCIF EEC would be removed as part of the project. This area equates to the plant community type Broad-leaved Ironbark Melaleuca decora shrubby open forest in the standard vegetation classifications used by the Framework for Biodiversity Assessment (Biodiversity Assessment Report in Appendix S of the EIS). This EEC was identified as requiring offsets in Section 7 of the Biodiversity Assessment Report (Appendix S of the EIS).

Detailed mitigation measures to minimise impacts on the residual CRCIF EEC would be developed as part of the project and are explained in section 6.6 of the Biodiversity Assessment Report (see Appendix S of the EIS). Mitigation measures would be included in a Flora and Fauna Management Plan and would include project specific measures such as native vegetation management of the CRCIF EEC.

Ongoing management of residual CRCIF EEC would be undertaken as part of the project which would provide continuity with the M5 East Motorway approval with respect to the remaining vegetation, noting that offsets would be provided for the 1.4 hectares that would be removed through the project construction.

5.21 Greenhouse gas and climate change

5.21.1 Construction greenhouse gas emissions

Six submitters raised issues regarding greenhouse gas emissions during construction.

Issue description – greenhouse gas emissions from construction

Submissions raised concern that construction activities, including the removal of vegetation, would contribute to greenhouse gas emissions and the project's carbon footprint.

Response

Key greenhouse gas emissions sources during construction of the project are summarised in Table 22-2 and shown in Figure 22-1 of the EIS.

Greenhouse gas emissions calculations are provided in Table U-6 of Appendix U (Detailed greenhouse gas calculations) of the EIS. These calculations demonstrate that the majority of greenhouse gas emissions associated with the construction of the project are attributed to indirect Scope 3 emissions (59 per cent). Scope 3 emissions include upstream / downstream emissions generated in the wider economy due to third party supply changes and road users. In the case of construction of the project, Scope 3 emissions included things like the manufacture of fuels, plant and equipment.

Direct Scope 1 and indirect Scope 2 emissions account for 18 per cent and 23 per cent of total construction emissions respectively. Scope 1 and Scope 2 emissions are the direct and indirect emissions from the project, respectively. In the case of construction of the project, Scope 1 emissions included things like fuel consumption on site and clearing of vegetation, while Scope 2 emissions included consumption of electricity from the grid.

Measures to reduce energy consumption and resource requirements, and therefore greenhouse gas emissions for the project's carbon footprint, are inherent in the optimised design of the project. Section 22.4 of the EIS (as revised in **Chapter 8** (Revised environmental management measures) of this report) provides a list of measures that would be implemented to further reduce greenhouse gas emissions during construction of the project, including:

- Preparation of a Greenhouse Gas Emissions Strategy and Management Plan for the project
- Assessment of the emissions intensity of significant construction materials specified in the design of the project and, where feasible and in compliance with technical engineering specifications, selection of low emission construction materials
- Use of recycled content road construction materials, such as recycled aggregates in road pavement and surfacing, where feasible
- Selection, where feasible and reasonable, of construction plant and equipment that has the highest fuel efficiency or that uses lower greenhouse gas intensive fuel such as biofuels (e.g. biodiesel, ethanol)
- Procurement of locally produced goods and services, where feasible and cost effective, to reduce transport fuel emissions.

Table 22-1 of the EIS summarises the emission sources and activities considered within the project's greenhouse gas assessment boundary for construction and operation, according to emission scope.

5.21.2 Operational greenhouse gas emissions

2,797 submitters raised issues regarding greenhouse gas emissions during operation

Issue description – project would increase greenhouse gas emissions

Submissions have raised concern that the project would increase greenhouse gas emissions through increased car use during operation.

Response

An assessment of greenhouse gas emissions as a result of the project is included in Chapter 22 and Appendix U (Detailed greenhouse gas calculations) of the EIS. The assessment of operational emissions included an assessment of key parallel routes which currently serve as alternative to the M5 East Motorway.

While the project would result in the generation of greenhouse gas emissions during construction and operation, the assessment found that by 2031, operational project emissions would be less than those generated from existing roads under the 2031 'do minimum' (without project) scenario. In other words, the project would contribute to a reduction in greenhouse gas emissions by 2031. This is mainly as a result of more efficient and less congested traffic conditions resulting in lower emissions.

The results of the greenhouse gas assessment for 2021 (which is around a year into operation of the project) indicate that the project would generate an additional 109,600 t CO_2-e of Scope 3 emissions associated with fuel use of light and heavy vehicles using roads within the study area, compared with the 2021 'without project' scenario.

Over the longer term, the assessment results indicate the project would reduce annual Scope 3 greenhouse gas emissions associated with operational road use emissions by around 229,200 t $CO_{2\text{-}e}$ in the 2031 'with project' scenario, and by around 1,874,000 t $CO_{2\text{-}e}$ in the 2031 'cumulative' scenario' (including the full WestConnex program of works), within the study area.

The results for 2031 capture the benefits of road tunnel usage in urban areas, where travel along a more direct route at higher average speeds results in fewer greenhouse gas emissions being generated by road users, compared with stop–start driving on congested roads.

The predicted reduction in greenhouse gas emissions as a result of the project would be due to an improvement in vehicle fuel efficiency for most links within the study area, including key parallel routes, as well as the operational efficiency of the project tunnels.

The magnitude of greenhouse gas emissions savings for the future 'cumulative' scenario is likely to be attributed 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 Technical Working Paper: Traffic and transport (Appendix G of the EIS).

Issue description – assessment of greenhouse gas emissions

Submissions have raised concerns that the impacts of greenhouse gas emissions have not been adequately assessed, including long-term impacts.

Response

The methodology for the greenhouse gas assessment described in Section 22.1 of the EIS has been based on relevant greenhouse gas 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 2005)
- 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) (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 greenhouse gas 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 greenhouse gas emissions associated with the project, the following steps were followed:

- Define the assessment boundary and identify potential sources of greenhouse gas 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 greenhouse gas emissions associated with each greenhouse gas source using equations and emission factors specified in the NGA Factors and the TAGG Workbook.

Appendix U of the EIS (Detailed greenhouse gas calculations) provides a detailed description of the greenhouse gas assessment methodology, including the emissions factors used for emission sources, and detailed calculation methods used to estimate the greenhouse gas emissions from fuel combustion, electricity consumption, vegetation clearing, materials use and the decomposition of waste.

Issue description – alignment with the Paris Climate Conference commitments

Submissions suggested the project is in direct opposition to the commitments made by Australia at the Paris Climate Conference, and that government is not taking climate change seriously.

Response

A global climate agreement was reached at the 21st Conference of the Parties (COP21) held in Paris in December 2015. The Paris Agreement provides a framework for all countries to take action on climate change post 2020, including a commitment to set emissions reduction targets and promote action to adapt and build resilience to climate impacts (DFAT, 2016).

An assessment of greenhouse gas emissions as a result of the project is included in Chapter 22 and Appendix U (Detailed greenhouse gas calculations) of the EIS. The assessment results indicate the project would reduce annual greenhouse gas emissions by around 229,200 t $CO_{2\text{-}e}$ in the 2031 'with project' scenario and around 1,874,000 t $CO_{2\text{-}e}$ in the 2031 'cumulative' scenario (including the full WestConnex program of works), within the study area assessed. The predicted reduction in greenhouse gas emissions as a result of the project would be due to an improvement in vehicle fuel efficiency for most links within the study area, as well as the operational efficiency of the project tunnels.

Based on the assessment of greenhouse gas emissions calculations presented in the EIS, the project would not be inconsistent with the Australian Government's greenhouse gas emissions reductions commitments.

Issue description – urban heat island effect

Submissions raised concerns regarding the contribution of the project, in combination with other motorways in Sydney, to the urban heat island effect.

Response

The majority of the project is underground in tunnels or involves replacing existing hard surfaces with new hard surfaces. While the project would remove 10.76 hectares of vegetation, this is the total removal across the entire project footprint, and is not concentrated in a single area. The vegetation to be removed is predominantly urban native and exotic vegetation (7.45 hectares) and would provide only a very localised benefit to residents directly adjacent to the vegetation (in terms of urban island

effect). Proposed landscaping would replace the planted vegetation that would be lost, which would help to offset potential impacts.

5.22 Aboriginal heritage

5.22.1 Potential impacts to Aboriginal heritage items

Two submitters raised issues regarding potential impacts to Aboriginal heritage items

Issue description – protection of Aboriginal cultural heritage

A submission sought clarification on how Aboriginal culture is being protected as part of the development, and how Aboriginal aspects would be incorporated into the design of the project to acknowledge traditional owners.

Response

The Technical working paper: Aboriginal Heritage in Appendix V of the EIS was prepared in accordance with the SEARs issued for the project. The consultation process identified the Metropolitan Local Aboriginal Land Council (MLALC) as the relevant Local Aboriginal Land Council (LALC) for this project as noted in Section 3.2 of Technical working paper: Aboriginal heritage (Appendix V of the EIS). A representative from MLALC participated in the archaeological survey.

Following the archaeological survey key observations were made:

- Combined, the archaeological field survey conducted for the project and the desktop review identified the following within one-kilometre of the study area:
  - Five newly identified potential Aboriginal sites
  - Seventeen previously recorded Aboriginal site
  - Twenty-one verified Aboriginal sites
  - One landscape area, being the Wolli Creek Valley Area.
- The archaeological survey identified five sandstone overhangs that are considered to be potential archaeological deposits (PAD) based on habitation area size and presence of potential deposits. Aboriginal rockshelter sites and sandstone overhangs have the potential to be impacted by vibration and settlement, both as a result of tunnelling or carrying out construction activities below or nearby the sites.
- No Aboriginal sites have been identified within areas that would be disturbed by the surface works as part of the project.

A summary of verified AHIMS sites and additional newly recorded Aboriginal sites within the study area is provided in **Table 23-3** of the EIS. A map showing their respective locations is provided in **Figure 23-1** of the EIS.

MLALC also prepared a cultural heritage survey report for the project, which is contained in Appendix B of the Aboriginal Heritage Assessment. Findings from the report were incorporated into the design development as part of an environmental constraints analysis.

Direct impacts to sites and items of known Aboriginal heritage items and areas of archaeological and cultural heritage significance have been avoided through the design of the project. The archaeologically sensitive Wolli Creek Valley Landscape Area is located adjacent to the Bexley Road East construction compound. No indirect impacts (including vibration) on areas of Aboriginal cultural significance are anticipated as a result of the project.

In addition to the design, and to further reduce the potential for impacts to Aboriginal heritage, environmental management measures relating to Aboriginal heritage during construction are provided in Section 23.4 of the EIS (as revised in **Chapter 8** (Revised environmental management measures) of this report). These would include:

- Baseline condition assessment, a maximum vibration level and vibration monitoring of the sandstone rock overhang site (SR-OVR-1) located in Stotts Reserve

- Compliance with the *Standard Management Procedure: Unexpected Heritage Items* (Roads and Maritime Services, 2015) for unexpected discovery of Aboriginal objects and human remains
- Specified conditions for pile installation at Alexandra Canal, including inspection of geotechnical coring sediment samples by a qualified archaeologist.

During detailed design of the project, consideration would be given to recognise Aboriginal occupation of the land, with the final landscape and urban design to be finalised with input from the local Aboriginal land council and community within the project corridor. In addition, a significant budget has been allocated to the commissioning of public artworks for the New M5. An art panel would be established by Sydney Motorway Corporation to oversee this commissioning process. This presents an opportunity for Aboriginal cultural heritage to be incorporated into the detailed design of the project to acknowledge the traditional owners of the land, in consultation with Aboriginal people.

5.22.2 New information

One submitter raised issues regarding new information.

Issue description – Aboriginal track

A community submission suggested that Parramatta Road forms a historical Aboriginal track, and raised concerns that this would be impacted by the project.

Response

Parramatta Road is outside the project footprint and as such the project would not impact on any potential Aboriginal site which may be present.

5.22.3 Level and quality of assessment

No issues raised in community submissions were categorised under 'level and quality of assessment'.

5.23 Resources use and waste minimisation

5.23.1 Construction resource use

No issues raised in community submissions were categorised as relating to resource use during construction.

5.23.2 Construction spoil

2,629 submitters raised issues regarding construction spoil generation and management.

Issue description – disposal of construction spoil

One submission expressed concern about the lack of information on the locations for spoil disposal in western Sydney and the potential impacts on local communities. The submission queried whether more consultation should be carried out with potentially affected local communities in western Sydney.

Response

Potential locations for the disposal of spoil that would not be reused onsite are discussed in Section 24.1.1 of the EIS.

A Spoil Management Strategy would be prepared and implemented for the project prior to the commencement of construction. The Strategy would identify spoil disposal locations and take into account the construction staging and specific conditions of approval that may be applied to the project.

Residual waste which cannot be re-used or recycled would be disposed of to a suitably licenced landfill or waste management facility. Sites which have been identified as being appropriately licenced and potentially having capacity for spoil disposal include:

- Boral CSR Brick Pit, Townson Road at Schofields – capacity of around 550,000 cubic metres. Licensed to receive wastes onsite (types of waste not restricted in Environment Protection Licence 2014)

- Defence Housing Australia Schofields Aerodome, Quakers Road at Quakers Hill – capacity of around 500,000 cubic metres. Further consultation would be required with Defence Housing Australia to confirm whether this site can receive such wastes
- Austral Bricks, 738-780 Wallgrove Road at Horsley Park – capacity of around 3,000,000 cubic metres. Environment Protection Licence 546 allows the receipt of wastes onsite if those wastes are covered by a current resource recovery exemption under clause 51A of the *Protection of the Environment Operations (Waste) Regulation 2005*. This site is also licensed to receive and apply wastes to land where this does not require licensing under the *Contaminated Land Management Act 1997* (NSW). Resource recovery exemptions relevant to the types of spoil generated by the project include those for excavated natural materials and excavated public road materials
- Sakkara Riverstone West (North West Growth Centre development), Brandon Road at Riverstone – capacity of around 3,500,000 cubic metres. Further consultation would be required with this developer to confirm whether this site can receive such wastes
- Kurnell Landfill Company 330 Captain Cool Drive at Kurnell – capacity of around 7,000,000 cubic metres. This site can receive virgin excavated natural materials, building and demolition wastes, and asphalt wastes only. This site cannot receive contaminated wastes.

Further consideration of spoil disposal requirements and locations would be carried out during the detailed design phase, with one or more of the locations listed above potentially identified as the preferred disposal location for excess project spoil.

Where environmental and planning approvals already exist for the receipt of spoil, no further action would be required. Where new or amended environmental or planning approvals are required for a particular disposal location, an appropriate environmental impact assessment, including community consultation, would be carried out in accordance with the requirements of the *Environmental Planning and Assessment Act 1979* (NSW) and other relevant environmental legislation.

Issue description – transport of contaminated spoil

One submission raised concerns about the transport of contaminated soil and asbestos through residential suburbs.

Response

The project would comply with all applicable standards and legislative requirements for the transport of hazardous and potentially hazardous materials. Haulage routes for the project, including roads to be used by vehicles carrying waste materials, have been identified.

Management and disposal of asbestos containing material would be undertaken in accordance with the following legislation, guidelines and standards as noted in Section 24.1.1 of the EIS,:

- *Work Health and Safety Act 2011* (NSW)
- *Code of Practice for the Safe Removal of Asbestos* 2nd Edition (National Occupational Health and Safety Commission (NOHSC) 2005a)
- *Code of Practice for the Management and Control of Asbestos in Workplaces* (NOHSC 2005b)
- *Protection of the Environment Operations (Waste) Regulation 2005* – clause 42 special requirements relating to asbestos waste
- *National Environment Protection (Assessment of Site Contamination) Measure 1999*
- AS2601:2001 Demolition of Structures.

An Unexpected Finds Protocol would be implemented in the event of encountering previously unidentified area(s) or types of contaminated material. Where this happens, all relevant work would cease in the vicinity of the discovery in accordance with an unsuitable spoil management contingency procedure which would be included as part of the Spoil Management Strategy for the project. Relevant works would not recommence until the need for, and scope of remedial action(s) (if required) are identified in accordance with the requirements of the *Contaminated Land Management Act 1997*.

All wastes identified within the Alexandria Landfill site as hazardous or potentially hazardous waste in accordance with the Waste Classification Guidelines (NSW EPA, 2014) would be stored, treated and transported in accordance with the *Protection of the Environment Operations (Waste) Regulation 2005*.

The Asbestos handling and management would be undertaken in accordance with asbestos management plans, relevant State legislation, government policies and Australian Standards. The plan(s) would outline measures to be implemented during various construction activities, to minimise health risks to the community and the project workforce. The plan includes the development of an Asbestos Removal Control Plan and an Asbestos Register to track where asbestos has been identified on the project. These commitments are provided in Chapter 30 (Environmental management measures) of the EIS and in **Chapter 8** (Revised environmental management measures) in this report.

Issue description - other construction waste

Submissions raised issues regarding the generation of other waste during construction.

Response

All wastes would be classified in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014) and would be stored, treated and transported in accordance with the *Protection of the Environment Operations (Waste) Regulation 2005*. Detailed waste management measures can be found in Section 24.2 of the EIS (amended in **Chapter 8** (Revised environmental management measures) in this report). Wastes would also be managed and disposed of in accordance with relevant State legislation and government policies including the *Protection of the Environment Operations Act 1997* (NSW), *Waste Avoidance and Resource Recovery Act 2001*, *Waste Avoidance and Resource Recovery Strategy 2014-2021* (EPA, 2014b), and the sustainable procurement objective of the *WestConnex Sustainability Strategy* (WestConnex Delivery Authority, 2015).

The project would comply with all applicable standards and legislative requirements for the transport of hazardous and potentially hazardous materials. Residual waste would be disposed of to a suitably licensed landfill or waste management facility where there are no other feasible and reasonable options for waste avoidance, reuse or recycling. Waste materials requiring removal from the site would be classified, handled and stored in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste* (EPA, 2014a) until collection by a contractor for disposal.

It is expected that existing and proposed metropolitan waste management facilities would have capacity to receive waste streams generated by construction of the project.

5.23.3 Operational resource use

No issues raised in community submissions were categorised under ‘operational resource use’.

5.23.4 Peak oil

No issues raised in community submissions were categorised under ‘peak oil’.

The issue of peak oil and the manner in which the project could contribute to peak oil is discussed in **Section 5.27.1** of this report.

5.24 Climate change

5.24.1 Climate change risk assessment and impacts

16 submitters have raised issues regarding climate change risk assessment, impacts and adaptations.

Issue description – climate change assessment

Submissions have suggested that the climate change risk assessment is simplistic in its approach and negligent in its consideration of adaptation and risk management strategies, particularly given the project’s underground tunnels, proximity to tidal waterways, and microclimates created by roadways.

Response

For the development of new infrastructure, such as the New M5 Motorway corridor, 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 climate change risk assessment has been undertaken in line with the following relevant standards and current guidelines:

- 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 ISO 31000:2009 Risk Management – Principles and guidelines
- Australian Green Infrastructure Council's Guideline for Climate Change Adaptation, Revision 2.1 (2011)
- Draft Climate Change Adaptation Practice Note (unpublished) (Roads and Maritime 2015).

As part of the risk assessment process an initial workshop was undertaken to engage with various members of the project team to identify risks from the perspective of various disciplines involved in preparing inputs into the EIS, including flood risks identified by the flood modelling team. Feedback collated as part of the workshop was used to inform the identification and rating of risks assessed by the EIS, as well as the appropriate adaptation actions to manage risks to the project.

During detailed design, a detailed climate change risk assessment would be undertaken in accordance with relevant standards and guidelines, including Australian Standard 5334-2013 *Climate change adaptation for settlements and infrastructure - A risk based approach*. AS 5334-2013 includes processes for communication and consultation with stakeholders, as well as monitoring and review to ensure the implementation of appropriate adaptation strategies.

Adaptation measures, including those to mitigate microclimate effects, would be further considered and refined during this detailed climate change risk assessment. The influence of tidal waterways on the project was considered in the climate change risk assessment undertaken for the EIS. The adaptation options put forward in the EIS included the incorporation of projected sea level rise into hydrological / hydraulic modelling undertaken during detailed design to ensure the project would not lead to unacceptable flood risks.

Issue description – climate change risk ratings

Submissions have raised concern regarding the low and medium rating of climate change risks in Appendix W of the EIS and that these risks have therefore not been considered or appropriate adaptation provided. Submissions have questioned the extent that medium risks would be considered and incorporated into the design given the 100 year design life of the project, and question the accountability of the project in terms of engineering and design, and risks to public health and safety.

Response

Roads and Maritime is currently in the process of finalising a Technical Guide for Climate Change Adaptation for the State Road Network. The Guide is aligned with existing Roads and Maritime processes and broader NSW Government initiatives and programs responding to climate change impacts. The climate change risk assessment presented in Chapter 25 (Climate change) of the EIS adopts the approach of the latest draft to ensure consistency with Roads and Maritime's approach to climate change adaptation.

The approach adopted for the climate change risk assessment included a number of steps for pre-screening and screening of climate risks to the project to identify potential exposure and vulnerabilities. As part of the pre-screening and screening steps, risk management measures inherently incorporated into the project's design through the implementation of relevant design standards and specifications and the assessment and management of other technical disciplines, were considered. These measures increase the project's resilience to climate change impacts and account for climate change adaptation as part of a 'no regrets' approach. An example of broader risk management incorporated into the project's design includes the completion of a flood impact assessment for the project.

In assessing the risk of climate change on the project, these broader risk management measures were considered to contribute to the resilience of the project and reduce potential exposure to climate change impacts. Climate risks identified as low or medium were ranked in the context of the broader risk management and design standards incorporated into the project's design.

Issue description – impact on climate change from the project

Submissions have raised the issue that the climate change risk assessment only considers climate change impacts on the project and does not consider the impact on climate change from the project. Submissions have questioned the Government's commitment to minimising the impacts of climate change in this regard.

Response

The Australian Government is committed to minimising the impacts of climate change through the implementation of emissions reduction targets and promoting action to adapt and build resilience to climate impacts in accordance with the global Paris Agreement reached at the 21st Conference of the Parties (COP21) in December 2015. This commitment is complemented by NSW Government policies and initiatives. *NSW 2021 – A Plan to Make NSW Number One* (NSW Department of Premier and Cabinet, 2011) includes targets to minimise the impacts of climate change by ensuring that 'NSW is ready to deal with major emergencies and natural disasters', as well as commitments to identify opportunities to increase resilience in local communities. In addition, the NSW Long Term Transport Master Plan (TfNSW, 2012) promotes the need to ensure that transport infrastructure is 'able to withstand the predicted impacts of a changing climate'.

Chapter 25 (Climate change) of the EIS recognises that the scope of the project includes assessment of the impact of future climate change on the project. The impact of the project on future climate change involves two aspects being:

- Climate change mitigation: Reducing the amount of GHG emissions emitted into the atmosphere.
- Climate change adaptation: Adapting or reducing vulnerability to the physical impacts of climate change.

Chapter 22 and Appendix U (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 are considered as a contribution to global climate change.

The focus of the climate change risk assessment was on the asset and its immediate services, not the project's contribution to climate change impacts on municipal scenarios involving all services, and adjacent infrastructure. This is outside the scope of the assessment.

The Australian Government's National Climate Resilience and Adaptation Strategy was released on 2 December 2015 and provides a set of guiding principles for climate adaptation and resilience including priorities for shared responsibility, climate risk factored into decision making, a risk management approach based on the best available scientific data, collaboration with stakeholders, and the need to revisit decisions and outcomes over time.

During detailed design, a detailed climate change risk assessment would be undertaken in accordance with relevant standards and guidelines. Risks associated with climate change and the inclusion of adaptation into project components would be revisited during the detailed design, pre-construction and operational stages of the project.

Interdependency analysis of surrounding infrastructure and services would be considered as part of a detailed climate change risk assessment undertaken during detailed design. Adaptation measures proposed as part of the detailed climate change risk assessment would be evaluated for interdependencies with other infrastructure and services, as well as the broader community context.

5.25 Hazard and risk

No issues raised in community submissions were categorised under 'hazard and risk'.

5.26 Cumulative impacts

5.26.1 Impacts of WestConnex projects

1,019 submitters raised issues regarding cumulative impacts of WestConnex related projects.

Issue description – cumulative impacts from WestConnex program of works

Submissions raised concerns regarding the cumulative impacts associated with other projects within the WestConnex program of works including:

- M4 Widening
- M4 East
- King Georges Road Interchange Upgrade
- M4–M5 Link
- Sydney Gateway
- Sydney Connector (formerly known as the Southern extension).

Concerns raised included general cumulative impacts from construction and operation of the WestConnex program of works, and specific concerns relating to:

- Dust generation
- Construction noise
- Heavy vehicle movements associated with spoil haulage and the potential impacts on residents adjoining the construction compounds and haulage routes
- Vegetation clearing.

Response

The cumulative impact assessment has been undertaken in accordance with the Secretary's Environmental Assessment Requirements (SEARs), which required that an assessment of the following be undertaken:

- Identification of how relevant planning, land use and development matters (including relevant strategic and statutory matters) have been considered in the impact assessment (direct, indirect and cumulative impacts) and / or in developing mitigation measures (to avoid, manage, offset and monitor impacts and where relevant, improve the existing environment)
- Details of the proposal's relationship to and consistency with the broader WestConnex, and an assessment of the cumulative impacts taking into consideration the WestConnex program of works
- Consideration of the potential cumulative impacts due to other development in the vicinity (completed, underway or proposed).

The assessment of the project's relationship to and consistency with the broader WestConnex program of works considered the potential for construction and operation cumulative impacts of the New M5 project and other WestConnex projects, as well as the future Sydney Gateway and the future Southern Connector. The assessment of potential impacts included consideration of impacts to (but not limited to) air quality, dust generation, noise and vibration, traffic and transport, social and economic, heritage (non-Aboriginal and Aboriginal) and biodiversity.

The assessment found that there was limited potential for cumulative impacts from other projects within the WestConnex program of works, as well as the future Sydney Gateway and the future Southern Connector. The potential for cumulative impacts between projects within the WestConnex

program of works and the current project was identified in the form of construction impacts where projects are undertaken in relatively close proximity to one another.

The program for construction activities associated with the future Sydney Gateway and Southern Connector projects are unlikely to coincide with the peak construction period of the project, and therefore the potential for construction cumulative impacts between these projects would be low.

Minor construction activities for the project, such as electrical fit-out, landscaping and rehabilitation works, may coincide with the early phases of construction of the Sydney Gateway and Southern Connector. However, major tunnelling and excavation works would have been completed by this time, and the likelihood of significant cumulative impacts relating to dust generation, noise and heavy vehicle movements would be low.

There would be the potential for cumulative impacts to nearby receivers relating to ongoing exposure to consecutive projects for receivers located in the vicinity of the current project and the future Sydney Gateway and Southern Connector projects. However, these impacts are likely to be low as the direct and indirect impacts to amenity would be minor having regard to the limited overlap construction programs.

Other projects within the WestConnex program of works, such as the M4 Widening and M4 East, are located further from the project and are unlikely to impact the M5 East motorway corridor during construction. The likelihood of cumulative impacts being generated by construction activities for the current project, the M4 Widening and the M4 East is therefore low. There is a negligible likelihood of cumulative impacts relating to ongoing exposure to construction projects for the current project and the M4 Widening and M4 East given the geographic separation between these projects. Cumulative impacts associated with the M4 Widening and the M4 East have been assessed in the respective EISs for those projects.

The two projects within the WestConnex program of works most likely to result in cumulative impacts with the current project during construction are the King Georges Road Interchange Upgrade project and the future M4–M5 Link. Construction work on the King Georges Road Interchange Upgrade commenced in July 2015 and is expected to be completed in 2017. Major work to construct the M4–M5 Link, pending potential approval in 2017 or 2018, could commence during financial year 2018/19 and would take around four years to complete.

Both of these projects would be located close to parts of the current project and would potentially involve overlapping construction periods. Cumulative dust generation, construction noise, heavy vehicle movements and spoil haulage impacts have been discussed in detail in Section 27.4 of the EIS and are summarised below. The assessment found that these cumulative impacts would be within acceptable limits following the application of management measures as identified in **Chapter 8** (Revised environmental management measures) of this report.

Cumulative dust impacts

The assessment of cumulative impacts in Chapter 27 of the EIS found that cumulative dust impacts associated with the King Georges Road Interchange Upgrade and the future M4–M5 Link would not be significantly different from those discussed in Chapter 10 of the EIS (Air Quality), which addresses the dust impacts of the current project alone. Any effects would be temporary and relatively short-lived, and would only arise during dry weather with the wind blowing towards a receiver at a time when dust is being generated and management measures are not being fully effective. The likely scale of this would not normally be considered sufficient to change the conclusion that, with management, the effects would not be significant.

Potential cumulative impacts relating to dust would therefore be within acceptable limits following the application of mitigation and management measures adopted for this project (as amended by **Chapter 8** (Revised environmental management measures) of this report). A Construction Air Quality Management Plan (CAQMP) would be prepared for the project as part of the Construction Environmental Management Plan (CEMP) which would describe how management measures would be implemented during construction to minimise dust, and the monitoring and reporting that would be undertaken to demonstrate the effectiveness of the measures. Community consultation, including management of complaints, would continue during construction.

Cumulative noise

The construction program for the King Georges Road Interchange Upgrade project would potentially overlap with part of the construction program for the current project. There is therefore potential for receivers around the western surface works to be affected by cumulative construction noise impacts from these two projects. Potential cumulative construction noise impacts could arise from:

- Finishing works for the King Georges Road Interchange Upgrade project, and potentially some road works scheduled for late in the construction program
- Early works, site establishment and potentially the initial phases of tunnelling for the New M5.

Given the nature of the potential concurrent works, and the anticipated noise impacts from each, it is expected that the dominant noise source during this period would be from construction of the project.

Specific measures for each project would be developed to coordinate mitigation and management of construction noise from concurrent construction activities. These measures would be detailed in the respective construction environmental management plans (CEMP) for the projects, and would include consideration of both physical and program measures (such as coordinating periods of respite).

There is the potential for some receivers to experience construction fatigue at these locations due to extended exposure to construction noise from both projects. However, it is expected that implementation of feasible and reasonable management measures would minimise these impacts.

There is the potential for localised cumulative construction works around the St Peters interchange (as a result of the future M4–M5 Link), as a portion of the site would potentially be used for a construction compound for that project, and local roads upgrade works for the New M5 scheduled into early 2019. Major work to construct the M4–M5 Link, pending potential approval in 2017 or 2018, could commence during financial year 2018/19 and would take around four years to complete. However, the potential for significant cumulative noise impacts is expected to be limited because the current project and the M4–M5 Link are unlikely to have concurrent peak construction periods.

During construction, the project team would undertake ongoing consultation with local communities potentially affected by concurrent and continuous noise from construction of projects in the WestConnex program of works. Additionally, consultation would be undertaken with proponents of other nearby projects to increase the overall awareness of project timeframes and potential cumulative impacts.

The Construction Noise and Vibration Management Plan for each project would identify specific management measures, taking into account the number and sensitivity of potentially affected receivers, the nature and duration of relevant construction activities, and the availability of feasible and reasonable management measures. A complaints management and response process would be put in place to address immediate concerns.

Cumulative heavy vehicle movements and spoil haulage

Construction haulage routes and vehicle access routes would be similar for the western surface works for the New M5 and the King Georges Road Interchange Upgrade project, given the location and nature of construction activities. However, most construction work associated with the King Georges Road Interchange Upgrade is likely to be completed before, or during the early stages of, the construction program for the New M5 western surface works. The potential for significant cumulative heavy vehicle or spoil haulage impacts in this area is therefore low, but the continuous program of works would result in a longer period of haulage through these areas.

Most of the New M5 local road upgrade works around the St Peters interchange would be expected to be completed before significant work begins on the M4–M5 Link. Tunnelling activities and spoil haulage for the New M5 would also be expected to be completed before significant construction works begins on the M4–M5 Link. This would significantly limit the potential for cumulative construction traffic noise impacts.

During construction, the project team would undertake ongoing consultation with local communities potentially affected by concurrent construction of other WestConnex projects, to increase the overall awareness of project timeframes and potential impacts.

In addition, a Construction Traffic Management and Safety Plan (CTMSP) would be prepared as part of the Construction Environmental Management Plan. The CTMSP would include the guidelines, general requirements and principles of traffic management to be implemented during construction, including:

- Signage requirements (e.g. temporary speed restrictions, changes to the road environment, traffic management controls)
- Lane possession and approval process during periods of online construction (e.g. line marking and temporary barriers)
- Traffic control devices such as traffic signals
- A local and regional communications strategy, including methods to provide advance notice of any major or prolonged impacts (e.g. leaflets and local media), and real-time information regarding current impacts (e.g. variable message signs, radio traffic news)
- Details of both the general approach to be used for access and egress to construction compounds and the specific controls required at specific locations
- Any specific provisions required to manage potential impacts on sensitive receivers, such as schools, child care centres and health facilities.

The CTMSP would be prepared in accordance with *Guide to Road Design* (Austroads, 2015) (with appropriate Roads and Maritime supplements), *Traffic Control at Work Sites* (RTA, 2010) 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.

Cumulative impacts on vegetation

Projects within the WestConnex program of works would require removal of areas of vegetation and fauna habitats.

The King Georges Road Interchange Upgrade project includes the removal of a small area (0.01 hectares) of Cook River / Castlereagh Ironbark Forest in the Sydney Basin endangered ecological community, the removal of low quality habitat (3.23 hectares) with potential food habitat for the Grey headed flying fox (*Pteropus poliocephalus*) and removal of nine affected Downy Wattle (*Acacia pubescens*) individuals. Given the small areas, poor condition and low site value scores, impacts on biodiversity would be minor for the King Georges Road Interchange Upgrade project.

The M4 East project would result in the loss of about 15.7 hectares of vegetation, comprising about 12.9 hectares of planted trees and screening vegetation (mainly along the M4), and about 2.8 hectares of grassland with scattered trees (e.g. Cintra Park and Reg Coady Reserve).

The construction of the M4 Widening project would affect up to 9.32 hectares of planted and remnant vegetation in various condition states with the remaining areas affected already having been cleared and modified. The estimated extent of impact includes approximately 0.38 hectares of remnant vegetation, 0.39 hectares of drainage lines that would be overshadowed and/or affected by pier construction, 8.55 hectares of planted and / or exotic vegetation.

Overall these projects and other developments would result in some further loss of habitat from an already modified environment with only limited natural biodiversity value. Cumulative impacts to biodiversity are therefore unlikely to be significant.

5.26.2 Impacts of other projects

19 submitters raised issues regarding cumulative impacts of other projects not related to the WestConnex program of works.

Issue description – cumulative impacts from projects not related to WestConnex

Submissions expressed concern that project planning had been undertaken without adequate consideration of general cumulative impacts from construction (including construction fatigue), operation and population growth resulting from other major developments and infrastructure projects in the area, including:

- Green Square
- Ashmore Estate / Precinct
- Waterloo Revitalisation (old Council Flats)
- Central to Eveleigh
- 18 Huntley Street at Alexandria
- Australian Technology Park
- RMS Marsh Street widening
- Sydney Metro City and Southwest, including Waterloo train station and associated development.

Response

The cumulative impact assessment for the project is included in Chapter 27 of the EIS. Cumulative impacts associated with other major projects in the vicinity that are not related to the WestConnex program of works is addressed in Section 27.5 of the EIS.

These major projects were identified through a review of the NSW DP&E register for major projects along and surrounding the project alignment at the time of writing the EIS. A review of strategic projects was also undertaken.

The cumulative impact assessment concluded that the potential for cumulative impacts of WestConnex and other projects was generally limited. Roads and Maritime Services and SMC would continue to consult with proponents of surrounding projects to minimise cumulative impacts.

The cumulative impacts from the Green Square Development were considered in Section 27.3.2 of the EIS. The assessment concluded that there would be some overlap of construction activities with the current project, but that the Green Square Development and other key developments identified such as Mascot Station Town Centre Precinct Masterplan and Wolli Creek redevelopment area would all be developed progressively (ie staged), and are generally located away from areas affected by the project.

Traffic and parking impacts from these developments are therefore unlikely to contribute substantially to cumulative impacts in the vicinity of the project during the construction phase. Consideration of potential cumulative construction and operation traffic impacts and modelling for projects outside the scope of the WestConnex program of works are discussed further in **Section 5.8.1** (Level and quality of traffic assessment for the construction period), **Section 5.8.9** (Level and quality of operational traffic assessment) and **Section 5.8.16** (Parking during operation) of this report.

The strategic traffic modelling on which the assessment of the project has been based incorporated future population growth from other major projects in the traffic predictions. Further information regarding the strategic traffic model is provided in Section 9.1.4 of the EIS and **Section 5.8.9** of this report.

5.27 Sustainability

5.27.1 Sustainability

913 submitters raised issues regarding sustainability

Issue description – peak oil

A submission raised concern that peak oil is currently an issue and sustainable modes of transport with low fuel consumption and / or greater transport energy efficiency should be a government priority. Submissions raised concern that the project would:

- encourage private motor vehicle use and reliance on oil for fuel
- lead to dependency on motor vehicle transportation
- have impacts to fuel security, fuel cost and safety.

Response

Although peak oil is not considered in the statutory requirements and the Secretary's Environmental Assessment Requirements (SEARs) for this project, Roads and Maritime acknowledges that it is prudent to consider peak oil.

The project may impact on intergenerational equity through the consumption of fuel resources during operation, potentially resulting in the decline of available fuel resources. Roads and Maritime notes that it is important to consider that oil production may peak and then decline which could increase the cost and reduce the availability of transport fuels and construction materials derived from oil. For transport, the solutions to the problem of 'peak oil' are similar to those for climate change. Alternatives to fossil fuels need to be found and transport must become more energy efficient.

Despite this, as well as efforts to limit demand for road transport, it is expected that the need for road transport would continue to grow. Congestion is expected to worsen as Sydney's population increases by another million people over the next decade. The bulk of this population growth is expected to occur in western Sydney.

Once completed, it is expected the WestConnex program of works would deliver an overall reduction in the quantity of fuel consumed. It is intended to link Sydney's west with the airport and the Port Botany precinct, increasing travel speeds, decreasing travel distances and improving travel efficiency. The New M5 project would:

- reduce traffic congestion on the M5 East Motorway, improving travel times to and from the airport
- improve traffic flowing traffic conditions resulting in reduced vehicle emissions.

There are moves to establish alternatives to oil as a fuel for transport and to improve energy efficiency. This would enable the economic benefits provided by road transport to continue to be delivered with a reduced need for fossil fuels. It is also noted that the project could also be used by non-fossil fuelled cars.

Concurrent with the WestConnex project the NSW Government is delivering significant new public transport projects which would ease the demand for private vehicle journeys across Sydney and contribute to lowering the use of fossil fuels. These projects include:

- Sydney Metro Northwest
- South West Rail Upgrade
- Parramatta Light Rail
- Sydney Light Rail
- Sydney Bus Futures Rapid Routes (13 priority rapid bus routes across Sydney).

A complete list of public transport projects can be found on the Transport for NSW website: http://www.transport.nsw.gov.au/projects.

Although outside the scope of this project, there are also a significant number of initiatives at the State and Federal level to improve transport energy efficiency and the carbon intensity of transport.

Significantly, in December 2015, the Australian Government and State and Territory Governments released the *National Energy Productivity Plan* which commits to improving energy productivity by 40 per cent between 2015 and 2030. The focus of the Plan is reducing the amount of energy used to generate each dollar of Gross Domestic Product. Relevant transport initiatives contained in the Plan include:

- improving energy productivity in government operations such as transport fleets and procurement
- improving light vehicle efficiency
- driving innovation in transport and infrastructure systems including the development of a National Policy Framework for Intelligent Transport Systems
- improving the liveability, accessibility and productivity of cities through the portfolio of the Minister for Cities and the Built Environment

- international collaboration on energy productivity and practices, such as in passenger and heavy-duty vehicle work streams
- reviewing the Fuel Quality Standards Act 2000.

In October 2015, the Australian Government announced a Ministerial Forum on vehicle emissions, chaired by the Minister for Major Projects. The Forum would report back prior to the Australian Government's announcement of new measures to deliver Australia's 2030 climate change targets in 2017-2018. The following measures would be reviewed:

- implementation of Euro 6 or equivalent standards for new vehicles
- fuel efficiency (CO_2) measures for new light vehicles
- fuel quality standards
- emissions testing arrangements for vehicles in conjunction with international regulatory agencies to ensure robust testing
- Australian Government measures under the National Clean Air Agreement
- Emissions Reduction Fund and Safeguard Mechanism – transport measures
- Future infrastructure to support new vehicles, including funding available through the Clean Energy Finance Corporation and Australian Renewable Energy Agency
- National Energy Productivity Plan.

At the State level, the *NSW Long Term Transport Master Plan* contains a number of measures for managing vehicle emissions, including:

- Shifting to low emissions and more sustainable energy sources for public transport and increasing energy efficiency
- Making land use choices that would help to reduce car use and integrate freight planning
- Providing opportunities to use public transport instead of private vehicles
- Fleet modernisation to meet tougher emissions standards and greater energy efficiency
- Restructuring motor vehicle registration charges to encourage the use of low emission vehicles
- Managing congestion
- Increasing walking and cycling.

Issue description – sustainability of the project

Concerns were raised that the project was not an environmentally, economically or financially sustainable urban development that creates sustainable living and work environments.

Response

Section 28.2.4 of the EIS describes the WestConnex Sustainability Strategy (WestConnex Delivery Authority, 2015) (Sustainability Strategy) and how sustainability initiatives would be integrated into the design, construction and operation of projects across WestConnex. The Sustainability Strategy outlines WDA's sustainability vision, commitments, guiding principles, objectives and overarching targets across a range of sustainability themes. It was prepared to align with the Transport Environment and Sustainability Policy Statement (TfNSW, 2013a) and the Transport Environment and Sustainability Policy Framework (TfNSW, 2013b), as well as other relevant NSW Government sustainability policies and guidelines.

Environmental issues outside of the scope of this project are considered through the suite of national and NSW policies. The Australian Government Department of the Environment designs and implements the Australian Government's policies and programmes to protect and conserve the environment, water and heritage and promote climate action.

The strategic context and need for the project were described in Chapter 3 of the EIS. As stated, the key driver for the project was the relief of congestion along the existing M5. This congestion problem

is expected to worsen as Sydney's population increases by another million people over the next decade. The bulk of this population growth is expected to occur in western Sydney.

The use of private vehicles by this increasing population is not contingent on the project or the WestConnex program of works. With or without the project, the population of western Sydney would require transport to locations that are dispersed throughout the Sydney metropolitan area and not necessarily serviced by public transport. Furthermore, the development of the project or the WestConnex program of works does not preclude the use of electric vehicles, the ongoing development of public transport, or other energy efficient transport options

Issue description – sustainable alternatives

Submissions suggested sustainable alternatives including improved active and public transport, and requested focus towards renewable energy and projects that encourage the development of alternative energy sources.

Response

Chapter 3 of the EIS for the New M5 provides detailed information about the need for the WestConnex program of works and the New M5 as a component of those works. The strategic importance of WestConnex as just one part of a broad suite of transport infrastructure projects, including public transport measures, is also detailed in that chapter. Importantly, the EIS outlines the Government's plan to pursue this suite of transport infrastructure projects to tackle current and future congestion issues, recognising that no single project in isolation would provide a complete solution.

Chapter 4 of the EIS outlines the development of the project and alternatives to the New M5 that have been considered. Alternatives to the New M5, including optimising existing infrastructure, demand management, additional public transport and the 'do nothing' option are assessed in the chapter against the key project objectives. Alternative 3 (Section 4.2.2 of the EIS) assessed the alternative of investing only in public transport, active transport and rail freight improvements.

This assessment of the alternatives demonstrated that the New M5 provides the best complete response to the project objectives, relative to alternatives, and within the broad suite of transport infrastructure projects proposed to address congestion across Sydney.

Concurrent with the WestConnex program of works the NSW Government is delivering significant new public transport projects which would ease the demand for private vehicle journeys across Sydney and contribute to lowering the use of fossil fuels.

Further, the project would:

- Include an Energy Efficiency and Greenhouse Gas Emissions Strategy detailing processes and methods to improve energy efficiency and reduce greenhouse gas emissions
- Ensure a percentage of energy is sourced from renewable energy generated onsite and/or accredited GreenPower. The current target is to source a minimum of six per cent of energy from renewable energy generated onsite and / or accredited GreenPower
- Optimise the design and operation of the motorway to minimise energy used by vehicles using the motorway.

Issue description – sustainability objectives

Concerns were raised that the project fails to meet the objective 'minimise energy use during construction and operation', stating that roads are one of the most intensive ways of moving people and freight, and that road construction is energy intensive. Submissions were concerned that the project would encourage further travel distances and result in increased transport energy use.

Response

The WestConnex Sustainability policy framework has been informed by the *NSW Government Resource Efficiency Policy* (OEH, 2014). The policy aims to drive resource efficiency, with a focus on energy, water and waste, and reducing harmful air emissions. The policy aims to ensure NSW Government agencies show leadership by incorporating resource efficiency in decision-making.

The policy includes specific measures, targets and minimum standards to drive resource efficiency. Refer to Chapter 22 of the EIS (Greenhouse gas) for information regarding how the project aligns with the *Resource Efficiency Policy*.

The project would meet the overarching sustainability objectives of the WestConnex Sustainability Strategy Framework, including the 'optimise resource efficiency (material, energy, water, land) and waste management' objective

In terms of energy and carbon, sustainability targets include:

- prepare an Energy Efficiency and Greenhouse Gas Emissions Strategy detailing processes and methods to improve energy efficiency and reduce greenhouse gas emissions
- a percentage of energy is to be sourced from renewable energy generated onsite and/or accredited GreenPower. The current target is to source a minimum of six per cent of energy from renewable energy generated onsite and / or accredited GreenPower
- optimise the design and operation of the motorway to minimise energy used by vehicles using the motorway.

At least six per cent of construction energy required for the project would be sourced where possible from an accredited GreenPower energy supplier. It is expected about two per cent of construction phase power requirements would be offset in accordance with the Commonwealth Government's *National Carbon Offset Standard*. This would be reviewed during detailed design to refine the approach to offsetting energy requirements and to identify whether additional power consumption can be offset.

An Energy Efficiency and Greenhouse Gas Emissions Strategy would be prepared as an attachment to the Sustainability Management Plan during detailed design. The strategy would identify initiatives to be implemented during construction of the project to reduce carbon emissions, energy use and embodied life cycle impacts.

The main alignment tunnels would be designed to minimise fuel use for motorists using the road. For example, the project would provide a vertical alignment that allows consistent vehicle speeds to be maintained. Further, low carbon energy generation options would be investigated as part of the design process in order to reduce the demand on mains electricity where feasible. Additional detail regarding energy efficiency is provided in Chapter 22 (Greenhouse gas) of the EIS.

The WestConnex Sustainability Strategy (WestConnex Delivery Authority, 2015) also describes how sustainability initiatives would be integrated into the design, construction and operation of projects across the WestConnex program of works. It provides a framework to implement sustainability objectives and targets through the project's contract requirements, competitive tender evaluation process and project specific Sustainability Management Plans during the design and construction stage.

The project would achieve an Infrastructure Sustainability (IS) rating of 'Excellent' for the design and construction phases of the project. The IS rating scheme was developed and is administered by the Infrastructure Sustainability Council of Australia (ISCA). The IS rating scheme is a comprehensive rating system for evaluating sustainability across the design, construction and operation of infrastructure. The Sustainability Strategy has been prepared to guide the implementation of sustainability across the WestConnex program of works and to facilitate the ISCA rating process.

A project-specific Sustainability Management Plan would be prepared to guide the implementation of sustainability throughout the design and construction phases, and to facilitate the achievement of the ISCA rating.

Issue description – ecologically sustainable development and inter-generational equity

Submissions raised concern the project does not meet ecologically sustainable criteria for inter-generational equity generally, and in regards to air quality associated with ventilation stacks.

Response

Section 28.4 of the EIS discusses ecologically sustainable development of the project. 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* (EP&A Act) (section 5 (a) (vii)) to encourage ecologically sustainable development. This would be achieved through the implementation of the four principles of ecologically sustainable development, including intergenerational equity. In broad terms, inter-generational equity refers to the premise that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. The project has been considered in terms of intergenerational equity, with the management of potential environmental impacts discussed throughout the EIS.

During construction and operation of the project, opportunities would be taken to reduce material use and maximise the use of materials with low embodied environmental impact where practical. For example:

- Recycled products would be used during construction of the project to reduce the demand on resources, in instances where the use of such materials is cost and performance competitive
- At least six per cent of construction energy required for the project would be sourced from renewable energy generated onsite and / or from an accredited GreenPower energy supplier
- Water efficiency measures would be implemented with a focus on achieving water savings and targeting water recycling and re-use
- About 80 per cent of construction and demolition waste is anticipated to be reused and / or recycled as part of the project.

The project would benefit current and future generations by improved air quality within the existing M5 East Motorway tunnel and a reduction in greenhouse gas emissions.

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 project. However, the total number of receivers with exceedances decreased slightly with the project. More detail regarding the air quality assessment is provided in Chapter 10 of the EIS.

5.28 Out of Scope

5.28.1 Voluntary (wanted) additional acquisition

Three submitters raised issues regarding voluntary acquisition of properties.

Issue description – voluntary acquisition of property

Submissions suggested that voluntary acquisition should occur due to impacts on property and hardship. Owners of the properties proposed for partial land acquisition also requested the entire property be acquired.

Response

Under the *Land Acquisition (Just Terms Compensation) Act 1991*, only properties required for the construction of the project are able to be acquired. In accordance with this legislation compensation is only payable where the whole or a part of the property is acquired for the project. The consideration of potential environmental impacts of the project on surrounding properties and the requirement, where necessary, for amelioration or attenuation actions or treatments is a function of the EIS.

Residential property owners who have exceptional personal circumstances resulting in a need to sell their property of who are experiencing significant hardship due to having been unsuccessful in the sale of their property as a result of the existence of the project, may request Roads and Maritime to consider their particular personal circumstances. In instances where Roads and Maritime considers that the owner's hardship circumstances are significant and exceptional, Roads and Maritime may, at its discretion, consider such circumstances as warranting purchase of the property by Roads and Maritime. In such exceptional circumstances, the purchase would be based on the market value of the

property with each party being responsible for its own costs of sale. The property would be valued based on an assessment of its market value, unaffected by the project.

The owner's personal circumstances in these situations do not include conventional environmental issues which are considered as part of the EIS process. Should residential owners wish to discuss their particular circumstances they may, in the first instance, contact the WestConnex project information line on 1300 660 248.

Issue description – request to extend property boundary

A submitter raised concerns that the demolition of 5 Florence Street and 134 Campbell Street at St Peters, would result in the creation of a laneway at the rear of 7 Florence Street, which may impact on the security of the property. The submitter requested an extension of the rear boundary of their property to create adjoining property boundaries with Brown Street residences in preference to a laneway. The submitter also requested that the Campbell Street boundary of the property be extended to allow the construction of a fence to improve security.

Response

The reconfiguration of property boundaries is beyond the scope of the EIS. Consultation with affected property owners to discuss property impacts has been ongoing. Consultation with affected property owners would continue during detailed design and through to construction of the project.

Minimising the acquisition of private property was a key aim of the project design. This has been achieved by locating the majority of the project's surface infrastructure within existing road reserves where practicable, and by using properties already owned by Roads and Maritime and the New South Wales Government.

Potential changes for receivers adjacent to the Campbell Road widening works have been assessed in the relevant sections of the EIS, including Chapter 9 (Traffic and transport), Chapter 10 (Air quality), Chapter 12 (Noise and vibration) and Chapter 14 (Visual impacts and urban design). The impacts on local amenity have been demonstrated as being within acceptable limits subject to the implementation of appropriate management measures. These management measures are summarised in the relevant chapters of the EIS and in **Chapter 8** (Revised environmental management measures) of this report.

5.28.2 Issues outside the scope of the project

67 submitters raised issues regarding items which are not within scope for the project.

Issue description – increase in traffic and road network changes in areas outside the scope of the project

Submissions have raised concerns regarding traffic issues in areas outside the scope of the project, including:

- The intersection of Victoria Road and The Crescent at Rozelle is already a bottleneck, and should be integrated with the Rozelle interchange to manage increased traffic
- The project would divert and increase traffic in Camperdown.

Response

The above intersections or road sections are beyond the extent of the New M5 project. The WestConnex M4–M5 Link would provide connections to Rozelle and Camperdown. This project is currently being developed and is subject to separate assessment and approvals.

Issue description – Sydney Airport and airport at Badgerys Creek

Submissions have raised concerns regarding the Sydney Airport and airport at Badgerys Creek, including:

- The future growth of Sydney Airport would be limited by the construction of the new airport in west Sydney
- A new rail link to the new airport has not been considered in the strategic context of the project

- A submission raised concern that the impact of the new airport at Badgerys Creek has not been considered in regards to the need for the project.

Response

The Australian Government is in the process of developing a Western Sydney Airport at Badgerys Creek. The NSW Government is supporting the delivery of road upgrades around the site to facilitate the airport, which would be accessible via road links from the Westlink M7 Motorway, the M4 Motorway and the M5 Motorway, including those being assessed as part of WestConnex.

The Western Sydney Airport project is currently in its early stages, with operations potentially commencing in the mid-2020s. The impact of the proposed new airport at Badgerys Creek on the future growth of Sydney Airport is outside the scope of this project. The strategic context and project need of the New M5 are discussed in Chapter 3 of the EIS.

Issue description – impacts from population growth

Submissions have raised concerns that expansion of town centres to accommodate more multi-storey developments would result in congestion of already overcrowded roads and footpaths, and impact communities. Further, the population growth within the local area of localities such as Alexandria would also impact public transport, childcare, education and medical facilities in the vicinity of the project. Local roads, train and bus services are over capacity and no infrastructure is planned to alleviate these problems.

Response

The traffic and transport assessment for the project was based on the WestConnex Road Traffic Model (WRTM), which includes information on projected population growth.

New developments are subject to separate planning approvals, which must consider the transport and traffic implications before they are approved.

The NSW Government is committed to meeting the needs of population growth. The *State Infrastructure Strategy 2012-2032* (Infrastructure NSW 2012x) and updated *State Infrastructure Strategy* (2014), *A Plan for Growing Sydney* and *NSW Long Term Transport Master Plan* (Transport for NSW, 2012x all provide recommendations on the integrated transport solution required. All of these documents note the importance of WestConnex in meeting the needs of Sydney into the future.

Issue description – issues unrelated to the project

The following issues and requests were featured in submissions:

- The construction of apartment blocks near railways is creating unpleasant living conditions
- Developers need to stop overbuilding in Sydney
- Request that Hurstville is rezoned due to a recent Council employment lands study
- Concerns that families would be forced out of Sydney due to difficult climate and overcrowded parks, schools and day-care centres
- Concern regarding the collusion with developers for the removal of trees in Anzac Parade to enable the construction of a hotel
- Requests for a 40 kilometre per hour school zone to be implemented for St Peters Public School
- Requests for a response from the Premier with regard to submissions
- Satisfaction with the NSW government's improvement of the public transportation system
- Commentary and statements regarding the Premier, Ministers and other politicians
- Concern there is no proposal to construct a new light rail to Maroubra
- Concern Mascot Station precinct residents experience bad peak hour travel times
- Drivers should not be able to attain a licence without being able to read
- Concern regarding the expansion of clearways across Sydney restricting outdoor dining

- Requests for the relocation of power poles on May Street
- Traffic numbers are inflated to 'make a case' for Cross City and Lane Cove Tunnels, resulting in increased tolls and forcing drivers to return to the original routes
- Request for better land use planning to see jobs co-located with affordable housing city-wide
- Existing public transport leading into the Sydney CBD are overcrowded, infrequent, chaotic and unreliable
- Newcastle, Parramatta, Chatswood, Hurstville and Wollongong should become major centres to take the pressure of Sydney city
- Concern for the shared sewer at Lot 1 DP 581196 and Lot 2 DP581196 of St Peters becoming blocked by the project
- Comments regarding the failure of Los Angeles transport infrastructure
- Endorsement of the Kyeemagh-Chullora Road Enquiry
- Concerns regarding coal seam gas and coal mining in Australia
- Requests for the development of an inland lake
- Project funding should be used to build a tunnel under the Blue Mountains, thus opening up the whole area of Bathurst, Lithgow, Parkes, Forbes and Mudgee to easy access to Sydney.

Response

The issues and requests listed above are beyond the scope of this project.

Issue description – King Street Gateway

The following issues and requests were featured in submissions:

- Concerns regarding the construction of the King Street Gateway project
- Cost analysis provided by SMC does not include the subsequent cost of Roads and Maritime Services road projects such as the King Street Gateway, which would add further cost to project and significantly influence the financial viability of the entire project.

Response

Roads and Maritime is committed to development and implementation of the King Street Gateway in consultation with relevant local councils (refer to **Chapter 2** of this report), which may include re-design of the intersection of King Street and Sydney Park Road.

King Street Gateway is not part of the WestConnex program of works, and outside the scope of the current project EIS. The King Street Gateway project would be subject to separate assessment and approval as required.

Issue description – Australian Technology Park

Submissions have raised the following concerns in regards to Australian Technology Park:

- Concerns regarding the Government's recent sale of the Australian Technology Park, and the effect this would have on the decentralisation of Sydney's West
- Concern rail capacity at Redfern Station would not be enhanced to cope with the influx of workers who would travel to work by train.

Response

The sale and transport issues associated with Australian Technology Park are beyond the scope of the project.

Issue description – request to extend property boundary

A submitter raised concerns that the demolition of 5 Florence Street and 134 Campbell Street at St Peters, would result in the creation of a laneway at the rear of 7 Florence Street, which may impact on

the security of the property. The submitter requested an extension of the rear boundary of their property to create adjoining property boundaries with Brown Street residences in preference to a laneway. The submitter also requested that the Campbell Street boundary of the property be extended to allow the construction of a fence to improve security.

Response

Consultation with affected property owners to discuss property impacts has been ongoing and would continue during detailed design and through to construction of the project.

Minimising the acquisition of private property was a key aim of the project design. This has been achieved by locating the majority of the project's surface infrastructure within existing road reserves where practicable, and by using properties already owned by Roads and Maritime and the New South Wales Government.

Potential changes for receivers adjacent to the Campbell Road widening works have been assessed in the relevant sections of the EIS, including Chapter 9 (Traffic and transport), Chapter 10 (Air quality), Chapter 12 (Noise and vibration) and Chapter 14 (Visual impacts and urban design). The impacts on local amenity have been demonstrated as being within acceptable limits subject to the implementation of appropriate management and management measures. These management measures are summarised in the relevant chapters of the EIS and in **Chapter 8** of this report.

5.28.3 Issues outside the scope of the project but WestConnex related

1,848 submitters raised issues regarding other projects within the WestConnex program of works.

Issue description – issues related to the M4 East

The following comments were raised by submissions in relation to the M4 East

- EIS submissions for M4 East were not published, thereby undermining community trust in the planning process
- The M4 East consultation process and submissions report were inadequate, and concerns were not adequately addressed
- The publication of the Submissions Report was not communicated to stakeholders
- M4 East should include an approval condition regarding adherence to the NSW Government's Major Projects Assurance Framework
- Concern the government signed a contract to construct the M4 East prior to receiving planning approval though the EIS process, demonstrating the approvals process is flawed
- The near completed toll gates on the M4 demonstrate that tax payers would be paying roads in the future for very little gain
- Impacts on Parramatta Road:
  - Increased traffic (including due to toll avoidance) and reduced network performance
  - Unattractive buildings on Parramatta Road should be demolished, and replaced with a continuation of the M4 instead
  - Parramatta road would experience little benefit as a result of this project
  - A similar investment in urban transformation along Parramatta Road would be more beneficial
  - Any improvements to Parramatta Road would occur via state and local government agreements acting in collaboration with the community (rather than from M4 East)
  - Parramatta Road should be used for heavy rail, instead of light vehicles
- Impacts on Haberfield:
  - Concern for 'rat-running' through the streets of Haberfield (Waratah), as cars exit WestConnex
  - Concern regarding the destruction of Haberfield

  - Issues and impacts to Haberfield in the M4 EIS have not been resolved
  - Concern for the protection of significant architecture in Haberfield
- Impacts to Ashfield:
  - Reduced network performance.

Response

Specific impacts associated with the construction and operation of the M4 East are beyond the scope of the New M5 project. The M4 East is being developed as a separate project and has been subject to a separate independent assessment process to meet the required legislative requirements.

The M4 East has been considered as part of the current project 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. Cumulative impacts of the M4 East and the New M5 have been assessed in Chapter 27 of the current project EIS.

The Minister for Planning approved the M4 East on 11 February 2016. Further information on the M4 East including the details of the EIS, and conditions of approval can be found on the WestConnex website (www.westconnex.com.au).

Issue description – acquisition of property

A submission raised concern regarding the purchase of Lot 393-103, Euston Road at St Peters by Roads and Maritime from a bankrupt developer.

Response

Roads and Maritime is conducting property acquisition for the project in accordance with the principles in the *Land Acquisition (Just Terms Compensation) Act 1991* and under the *Roads and Maritime Land Acquisition Information Guide* (Roads and Maritime, 2014), which require it to negotiate with the legal property owner, regardless of their financial position.

Issue description – issues related to the M4–M5 Link

The following comments were raised by submissions in relation to the M4–M5 Link:

- Requests the location and layout of construction compounds for the works associated with the M4–M5 Link be made available to the public
- Concerns impacts from the M4–M5 Link were not included in the EIS
- The impacts of Stage 3 should be fully explored in the decision making process for Stage 2. Concern the M4–M5 Link would not improve the traffic congestion in Edgeware Road at St Peters
- Concerns regarding the modelling and impacts from the M4–M5 Link, and subsequent conflicts with the widened M4 Motorway
- The future M4–M5 Link does not provide access to the CBD north, or consideration of an additional harbour crossing to allow for capacity constraints on the ANZAC Bridge and Harbour Bridge
- Concerns regarding the potential impact on heritage related to the M4–M5 Link
- Objection to the Rozelle interchange
- Concerns Anzac Bridge would be converted into a public park to divert traffic onto WestConnex
- Objection to the inclusion of the M4–M5 Link in the 'do something (2031)' scenario
- Requests that the consent authority consider building Stages 2 and 3 concurrently to avoid excessive traffic being spilled onto Euston Road at St Peters and adjoining streets in Alexandria
- Concerns details have been not been released on the route of the M4–M5 Link, impacts to suburbs and the location of the tunnelling mid-point.

Response

The size and scale of the WestConnex program of works requires the program of works to be delivered in stages.

The WestConnex program of works is naturally aligned to fit into three construction stages. This is primarily due to natural 'break points' where the program of works can be cost effectively integrated into the surrounding road network. As a result, the M4–M5 Link is being developed as a separate project and would be subject to a separate consultation, environmental assessment and approvals process.

The M4–M5 Link has been considered as part of this 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. Potential cumulative impacts of the M4–M5 Link and the current project have been assessed in Chapter 27 of the EIS.

Issue description – King Georges Road Upgrade

The following comments were raised in relation to the King Georges Road Interchange Upgrade:

- Community feedback was not incorporated into designs, as evidenced by residents impacted by the King Georges Road Interchange New M5 upgrade at Beverly Hills.

Response

The King Georges Road interchange upgrade project was subject to a separate EIS and has been assessed and approved under Part 5.1 of the EP&A Act by the NSW Minister for Planning on 3 March 2015. The King Georges Road project is currently under construction.

Issue description – M4 Widening

The following comment was raised in relation to the M4 Widening:

- Concern regarding disposal of asbestos waste from the M4 Widening.

Response

The M4 Widening project was subject to a separate EIS and was assessed and approved under Part 5.1 of the EP&A Act by the NSW Minister for Planning on 21 December 2014. The M4 Widening project is currently under construction and is being delivered in accordance with all planning approvals and construction environmental management plans.

Issue description – Sydney Gateway Project

The following comments were raised in relation to the Sydney Gateway:

- Concerns Sydney Gateway is not described in the EIS
- Concerns impacts property, costs, health, traffic modelling, and social and economic impacts on local communities have not been considered in the EIS
- Concern no information has been provided regarding how the Sydney Gateway would alleviate traffic level concerns in King Street, Enmore Road, Edgeware Road, Euston Road, Mitchell Street, Maddox Street, and other local roads.

Response

The Sydney Gateway is a component of the wider WestConnex program of works, and outside the scope of the EIS. The future Sydney Gateway is subject to further investigations and concept development by the NSW Government, and would be subject to separate environmental assessment and approvals process. The Sydney Gateway has been considered as part of the 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. Cumulative impacts of the Sydney Gateway and the project have been assessed in Chapter 27 of the EIS.

Issue description – Southern Connector

A submission requested the timing of the proposed Southern Connector (formerly known as the southern extension) be brought forward so it can be constructed concurrently with the project.

Response

The proposed Southern Connector from Arncliffe to Kogarah is currently being investigated by the NSW Government, separately to the WestConnex program of works. The Southern Connector would link the project to the southern and bayside suburbs of Sydney, and the proposed Gateway to the South project. The future Southern Connector is in early development stages, and subject to separate environmental assessment, approvals and consultation. Therefore, it is outside the scope of the EIS.

Issue description – M5 East Motorway directional signage

A submitter suggested that directional signposting for Tempe, Marrickville and other Inner West locations be provided on the existing M5 East Motorway to mitigate local traffic impacts.

Response

A signage strategy for the New M5 would be developed during the detailed design of the project. 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. Where reasonable and feasible, directional signposting may be refined within the existing M5 East Motorway in accordance with these and as is relevant to the New M5 project, however this is beyond the scope of the EIS.

Issue description – M5 South-West Motorway toll

A submitter queried whether there would be 'cash back' for private motorists using the M5 West motorway in 2031.

Response

The M5 South-West Motorway is beyond the scope of the project and as such is not assessed in the EIS.

Issue description – independent toll agency

A submitter recommended that an independent toll agency be established with the ability to decrease or increase tolls for the New M5 and M5 East within a cap to encourage efficient operation and the best use of the project by motorists.

Response

The establishment of an independent toll agency is outside the scope of the EIS.

In October 2014, the NSW Government agreed to a broad set of principles for tolling for Sydney's motorways. The new M5 would involve a distance-based tolling system with a toll cap, where the toll would be capped at a certain level to provide certainty to users and improve the overall value for money to the community. The New M5 and M5 East would have the same toll when the entire length is travelled, noting:

- To maintain access to Sydney Airport's International Terminal, trips using Marsh Street ramps to and from General Holmes Drive would be toll-free
- Trips through the M5 East tunnel and intermediate on and off ramps would be discounted from the maximum toll to reflect shorter trip
- Trucks would be tolled at three times that of cars.

5.28.4 Employment or business opportunities

No issues raised in community submissions were categorised under 'employment or business opportunities'.

6 Clarifications

This chapter describes clarifications to the Environmental Impact Statement (EIS) and minor refinements to project components where there has been further design development since the preparation and exhibition of the EIS. Various minor errors and discrepancies have been identified in the EIS and appendices. These are described below. Where relevant, the text provided can be considered to replace the text from the EIS and appendices. None of these minor errors and discrepancies would result in any significant change to the environmental impacts described in the EIS.

6.1 Project description

6.1.1 Local road upgrades

Section 5.7 of the EIS described the local road upgrades, and was supported by various figures throughout Chapter 5 of the EIS. Some discrepancies where identified and are clarified below. The clarifications are consistent with the traffic and transport impact assessment as presented in the EIS.

Euston Road and Sydney Park Road intersection

Section 5.7.1 of the EIS and Section 10.3.1.1 of Appendix G (Technical working paper: Traffic and transport) of the EIS described the upgrade of the Euston Road / Sydney Park Road / Huntley Street intersection, with reference to Figure 5-30 of the EIS.

The right turn southbound lane on Euston Road onto Sydney Park Road at this intersection would be for buses only. This design was included within the traffic and transport assessment for the project, but was not explicitly stated in the descriptions of the intersection, nor was it depicted in the figure.

This intersection has undergone further refinement in response to submissions and is discussed further in Section 7.2 (Local road upgrades) of this report.

Princes Highway, Campbell Street / Road, Barwon Park Road, Albert Street and Euston Road

As stated in Table 5-5 and depicted in Figure 5-32 and Figure 5-33 of the EIS, the project includes the following local road upgrades:

- Barwon Park Road would be a one-way road (northbound), with only left in permitted.
- Albert Street would be a one-way road (eastbound).
- An upgrade to the Campbell Street and Princes Highway intersection, including high angle left turn lanes at the Princes Highway and Campbell Street intersection
- An upgrade of the Euston Road and Campbell Road intersection with a new connection to the New M5.

However, some of these features were not correctly depicted on the St Peters interchange figures (Figures 5-7, 5-8, 5-25, 5-26, 5-45 and 5-46).

Figure 6-1 provides an overview of the interchange with the correct configuration for these components. This also includes a refinement to a shared path within Sydney Park, which is discussed in **Section 7.2** of this report.

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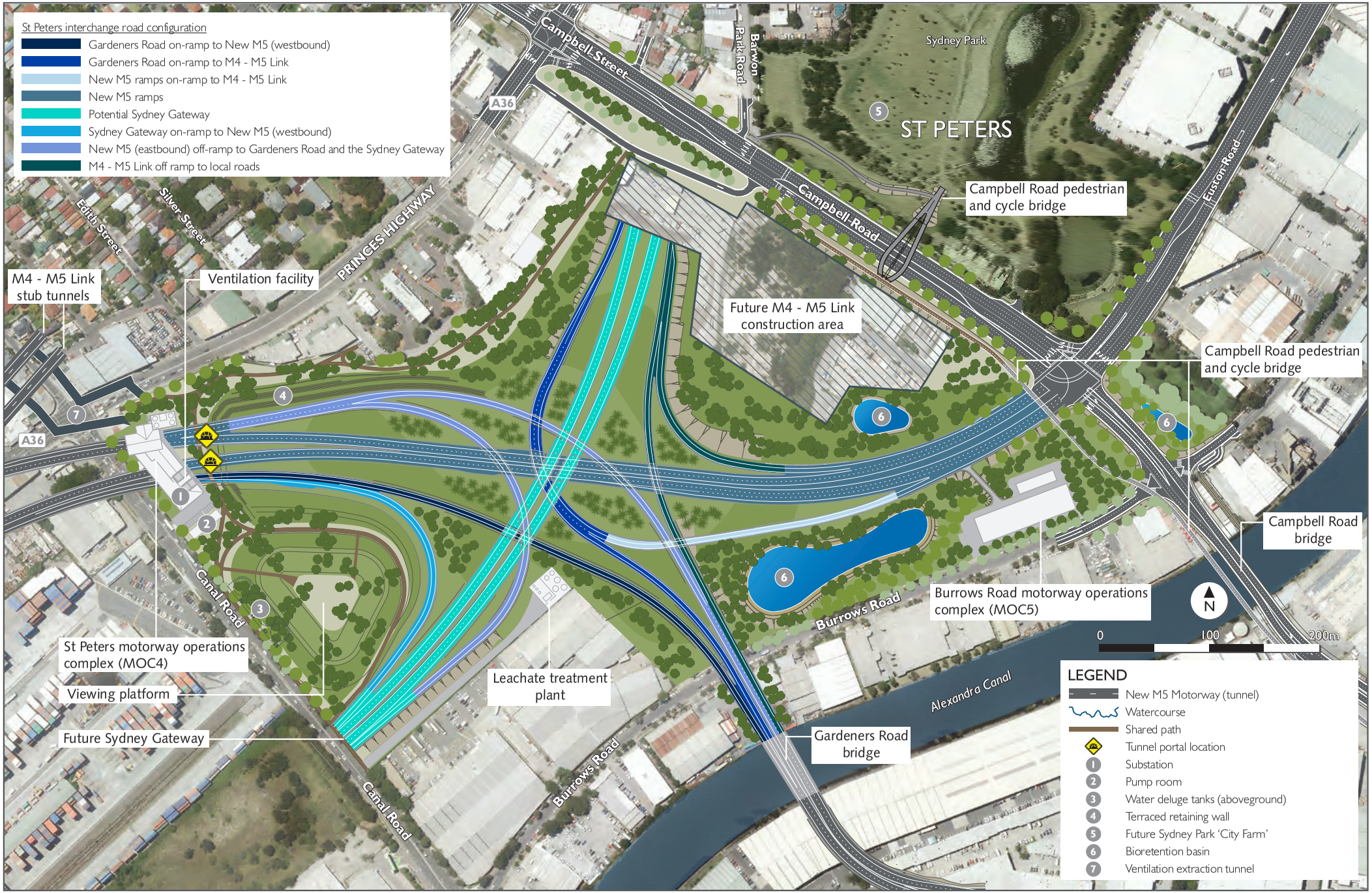

Figure 6-1 St Peters interchange - New M5 operational layout

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6.1.2 Roadside furniture and lighting (pedestrian and cycle facilities)

The pedestrian footpath is to be provided adjacent to the southern side of Campbell Road. This was not depicted in the figures provided in Chapter 5 of the EIS. Refer to **Figure 7-6** in **Chapter 7** (Preferred Infrastructure Report) of this report.

A pedestrian path would be provided along the eastbound lanes of Campbell Road (extension), the northbound lanes of Bourke Road, and the southbound lanes of Euston Road. This was not accurately depicted on Figure 5-33 and Figure 5-34 of the EIS, which indicated that this would be a shared path. Refer to Figure 5-26 of the EIS and **Figure 7-6** in **Chapter 7** (Preferred Infrastructure Report) of this report.

6.1.3 Landfill closure infrastructure (leachate treatment plant)

Section 5.9.3 of the EIS describes the leachate management system that would be implemented as part of the Alexandria landfill closure plan. The existing leachate treatment plant is being upgraded under the existing approvals for the landfill.

A new leachate treatment plant would be installed and would replace the existing upgraded leachate treatment plant. The capacity of this leachate treatment plant, as detailed in Appendix D (Alexandria Landfill Closure Plan) of the EIS, was specified as being 200 kilolitres per day. This capacity may in fact be reduced due to the reduction in leachate generation as a result of the groundwater cut-off wall. As such, the final required capacity of the leachate treatment plant would be confirmed during detailed design and in consultation with the Environment Protection Authority and the Department of Primary Industries (Water).

The environmental management measure (OpGW05) has been added to reflect this clarification:

- The final design capacity of the new leachate treatment plant would have a maximum 200 kilolitres per day and would be confirmed in consultation with Environment Protection Authority and Department of Primary Industries (Water) during detailed design.

6.2 Construction work

6.2.1 Construction program

Section 6.2 of the EIS identified the construction program for the project and an indicative construction program was provided in Table 6-2 of the EIS, which indicated that work would commence in the third quarter of 2016.

However, subject to environmental planning approval, construction of the New M5 is planned to commence in mid-2016 (either in the second or third quarter), with completion of construction expected in the last quarter of 2019.

6.2.2 Western surface works

Haulage routes – Kingsgrove South construction compound

Table 6-24 of the EIS and Table 40 of the Technical working paper: Traffic and transport described the construction volumes and access points associated with the western and Bexley Road surface works. This described a left-in, left-out access point directly onto the M5 East Motorway at the Kingsgrove South construction compound (C2), which would also cater for construction vehicles travelling to/from Kingsgrove North construction compound (via the Kindilan underpass). However, this was not accurately depicted in Figure 9-10 of the EIS or Figure 39 of the technical working paper. It was also not identified in Section 6.5.3 of the EIS in the description of the construction compound.

The correct haulage routes are provided in **Figure 6-2**. As the EIS had assessed this direct access from the Kingsgrove South construction compound, this clarification does not alter the outcomes of the assessment.

Construction hours – Kingsgrove South construction compound

Chapter 6 provides a description of the activities that would be carried out at the Kingsgrove South construction compound (C2), located to the south of the M5 East Motorway. This includes Section

6.5.3 (Temporary construction compounds), Section 6.6.4 (Construction compound access), and Section 6.7.2 (Construction work hours).

The Kingsgrove South construction compound is designated as a 'civil construction site', and is not a 'tunnel support site' in the meaning that it would not have the full range of activities as provided for in the Kingsgrove North construction compound (eg 24 hours a day, seven days a week of spoil handling and stockpiling).

However, as stated in Section 6.7.2 of the EIS, tunnelling and tunnelling support activities, including spoil handling and haulage, deliveries and underground construction and fit-out works would be carried out up to 24 hours per day and seven days per week. As stated in Table 6-26, this would include the movement of construction vehicles through the Kingsgrove South construction compound (C2) in order to obtain direct access on and off the westbound lanes of the M5 East Motorway up to 24 hours per day and seven days per week. The provision of direct access on and off the motorway alleviates the reliance for construction vehicles to use the local road network during construction.

Section 6.7.2 of the EIS did clearly state that tunnelling works including fitout work (but excluding blasting) would be undertaken 24 hours a day, seven days a week. However, it was not clearly stated that this would involve the movement of construction vehicles through the Kingsgrove South construction compound outside standard construction hours for activities associated with:

- Movements of construction vehicles to/from the Kingsgrove North construction compound (which includes tunnel support activities)
- Movements associated with the underground tunnel fitout activities via the western portal for the westbound tunnel (located on the southern side of the M5 East Motorway and within the Kingsgrove South construction compound site boundaries).

Further, this was not clearly identified in Table 6-27 of the EIS, which outlined the construction work hours at the construction compounds. As such, the Table 6-26 and Table 6-27 have been reproduced below as clarification to the proposed construction hours. These tables (**Table 6-1** and **Table 6-2**) must be read in conjunction with Section 6.7.2 of the EIS.

Table 6-1 Construction hours

Activity	Construction hours	Comments or exception
Tunnelling, tunnelling support and underground construction activities		
Tunnelling excavation	24 hours per day, seven days a week.	• The main alignment tunnels, tunnel stubs, ventilation extraction tunnels and all underground excavations would be carried out continuously. • Activities that support tunnelling works would occur 24 hours per day, seven days a week
Spoil handling and haulage	Up to 24 hours per day, seven days per week.	• Spoil haulage would be limited and managed during peak hours and special events • Vehicle movements would be limited and managed during evening and night-time in residential areas or close to identified sensitive receivers • Vehicle movements outside of standard construction hours would occur at the following construction compounds: – Kingsgrove North construction compound (C1) and Kingsgrove South construction compound (C2), via left-in, left-out access from the M5 East Motorway or via Garema Circuit, Wirega Avenue, Moorefields Road, Kingsgrove Road and King Georges Road[1] – Commercial Road construction compound (C3), via access from Commercial Road, Kingsgrove Road and the M5 East Motorway – Bexley Road North construction compound (C4), via Bexley Road, Canterbury Road and King Georges Road and the M5 East Motorway

Activity	Construction hours	Comments or exception
		– Bexley Road South construction compound (C5), via Bexley Road, Kingsgrove Road, Stoney Creek Road, Forest Road and the M5 East Motorway – Bexley Road East construction compound (C6), via Wolli Avenue, Frost Street, Douglas Street, Stoney Creek Road, Bexley Road, Forest Road and the M5 East Motorway[2] – Arncliffe construction compound (C7), via Marsh Street Princes Highway, Wickham Street, West Botany Street and the M5 East Motorway – Canal Road construction compound (C8), via Canal Road and the Princes Highway. • Spoil would be moved during the day, outside of peak periods where practical, feasible and reasonable management strategies would be investigated to minimise the volumes of heavy vehicle movements at night
Underground construction and tunnel fit-out	Up to 24 hours per day, seven days per week.	• Deliveries for underground construction would be subject to the same management measures as spoil haulage.
Out of hours activities for safety and operational reasons		
Out of hours activities for safety and operational reasons	At any time, subject to individual requirements.	• Construction activities would only be conducted outside standard construction hours for safety or operational reasons, including design and quality considerations and to avoid traffic interruptions • Specific management measures would be developed for each relevant activity or group of activities to manage potential impacts on sensitive receivers • The construction activities will include – Surface works at the Kingsgrove, Arncliffe & St Peters Interchange sites – Local road upgrade works – Bridge construction – Delivery of precast units & other materials – Services searches – Road maintenance works – Traffic control and switches – Line-marking – Service relocations & adjustments.
Surface construction activities (not specified elsewhere)		
Most surface construction activities	Daytime construction hours: • 7 am to 6 pm on weekdays • 8 am to 1 pm on Saturdays • No works on Sundays or public holidays.	• Surface works supporting underground construction • Construction traffic movements for tunnel support • Excavation and spoil removal from construction shafts and declines at the surface • Western surface works • Local road upgrades • Bridge construction • Surface works at the Kingsgrove, Arncliffe and the St Peters interchange.

Activity	Construction hours	Comments or exception
Blasting and rock breaking		
Blasting	Between 9:00am and 5:00pm, Mondays to Fridays and 9:00 am to 1:00pm on Saturdays	• Blasting would occur up to six days per week (Monday to Saturday). Blasts would be limited to one single detonation in any one day per receiver group, unless otherwise agreed by the NSW EPA through consultation on the Construction Noise and Vibration Management Plan.
Rock breaking (with potential for impulsive or tonal noise impact at a sensitive receiver)	Between 8:00am and 6:00pm Monday to Friday and 8:00am to 1:00pm Saturdays, with respite periods.	• Respite periods would be scheduled to minimise the frequency and duration of extended rock breaking activities with potential for impulsive or tonal noise emissions.
Minor or ancillary activities		
Minor activities	At any time	• Minor activities would include activities that do not lead to an exceedance of the applicable noise management level at an affected receiver.
Activities authorised by an environment protection licence	As specified in the environment protection licence.	• Construction activities would be managed as required by the Environment Protection Licence.
Emergency or directed activities		
Emergency or directed activities	At any time	• Activities would be carried out as directed by a relevant authority • Activities would be carried out if required to prevent an imminent loss of life or environmental damage.

1: Heavy vehicle movements from C1 outside of standard construction hours would occur via access and egress directly to and from the M5 East Motorway via C1 and/or C2. There would be times when direct access to the M5 East Motorway would be blocked due to construction works within the site and access would then be required via Garema Circuit

2: Only light vehicles would travel via Wolli Avenue, Frost Street, Douglas Street, Stoney Creek Road, Bexley Road and Forest Road

Table 6-2 Construction work hours at construction compounds

Construction compound	Type of construction activity	Construction work hours
Kingsgrove North (C1)	Tunnelling	24 hours a day, seven days a week
	Civil construction*	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Kingsgrove south (C2)	Civil construction*	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
	Construction vehicle movements to/from Kingsgrove North (C1)** or to/from the western portal (westbound tunnel)***	24 hours a day, seven days a week
Commercial Road (C3)	Tunnelling	24 hours a day, seven days a week

Construction compound	Type of construction activity	Construction work hours
Bexley Road North (C4)	Tunnelling	24 hours a day, seven days a week
Bexley Road South (C5)	Tunnelling	24 hours a day, seven days a week
Bexley Road East (C6)	Tunnelling	24 hours a day, seven days a week
Arncliffe (C7)	Tunnelling	24 hours a day, seven days a week
Canal Road (C8)	Tunnelling	24 hours a day, seven days a week
	Civil construction*	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Campbell Road (C9)	Civil construction*	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Landfill Closure (C10)	Civil construction*	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Burrows Road (C11)	Civil construction*	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Campbell Road bridge (C12)	Civil construction*	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Gardeners Road bridge (C13)	Civil construction*	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Sydney Park (C14)	Civil construction*	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays

*Some works outside of standard construction hours may be required

** Movements to/from Kingsgrove North construction compound (C1) via Kingsgrove South construction compound (C2) are associated with tunnelling support and spoil haulage from C1, and tunnel fitout activities at C1 and C2.

*** Movements to/from the western portal of the westbound tunnel through the Kingsgrove South construction compound (C2) is associated with tunnel fitout.

A number of scenarios for activities outside standard construction hours were assessed for Kingsgrove South construction compound in the construction noise impact assessment. Movements through the Kingsgrove South construction compound during the evening (6pm to 10pm) and night time period (10pm to 7am) would generate a similar or lower combined sound power level as assessed for the 'service installation and relocation' night time assessment scenario. The results of this scenario are presented below in **Table 6-3**. The assessment found that noise levels at sensitive receivers within the closest noise catchment areas to the construction compound (NCA 23, 24 and 25) would exceed the noise management levels (NML) during the evening and night time periods. However, none of these receivers would be 'highly noise affected'. All reasonable and feasible noise mitigation measures would be implemented, as provided in Chapter 7 of Technical working paper: Noise and vibration and detailed in the Construction Noise and Vibration Management Plan.

Table 6-3 Out of hours work predicted noise – General utility installation and relocation – Evening and night

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Evening (6pm to 10pm)						
NCA23	54	29	39	0	0	0
NCA24	55	37	52	0	0	0
NCA25	52	36	54	2	1	0
Night (10pm to 7am)						
NCA23	47	29	39	0	0	0
NCA24	47	37	52	5	8	0
NCA25	46	36	54	8	6	0

6.2.3 Bexley Road surface works

The Bexley Road East construction compound (C3), located on the eastern side of Bexley Road, would be used mainly for car parking and administrative support activities for the Bexley Road North construction compound (C4) and the Bexley Road South construction compound (C5). In Table 9-38 of the EIS, only light vehicles were identified as accessing this site once established.

Table 6-26 of the EIS identified the construction hours for the project, including vehicle movements that would occur outside standard construction hours. This table included a note stating that only light vehicles associated with the Bexley Road East construction compound would travel via Wolli Avenue, Frost Street, Douglas Street, Stoney Creek Road, Bexley Road and Forest Road during works outside standard construction hours.

However, heavy vehicles would need to access the Bexley Road East construction compound during site establishment and demobilisation. On rare occasions, heavy vehicle access would also be required for maintenance activities during construction. In these instances, the vehicles would access the site directly off Wolli Avenue via Bexley Road. Heavy vehicle movements would occur only during standard construction hours. As these would be occasional, this would not change the impacts as assessed in the EIS with respect to traffic or construction traffic noise.

6.2.4 Arncliffe surface works

For the Arncliffe surface works, Table 9-29 and Figure 9-16 of the EIS (and corresponding table and figure in the technical working paper) identified the vehicle routes that would be used for this area of construction. However, Figure 9-16 did not depict Route 4 as described in Table 9-29. The proposed depiction of the haulage routes is now provided in **Figure 6-3**. The impact assessment completed for the Arncliffe surface works has accounted for vehicles using the four construction routes, but included an additional route for vehicles turning right from the site access point onto Marsh Street. This movement would not be possible given the intersection upgrade. As the number of vehicles assumed to be making this movement in the impact assessment was low (in the order of four movements in the AM and PM peak period), this clarification does not alter the outcomes of the assessment.

6.2.5 Canal Road construction compound

For the Canal Road construction compound, Table 9-32 and Figure 9-18 (and the corresponding table and figure in the technical working paper) identified the vehicle routes that would be used by this compound.

As identified in Figure 9-18, the construction compound would be serviced by two access points. The first, which would service areas of the compound located closest to the Princes Highway / Canal Road intersection would be a left-in, left-out configuration. The second access point, located further south, would allow for left-in and right-out turning movements via new modifications to an existing signalised intersection opposite Cooks River Rail Terminal.

Figure 9-18 of the EIS depicted a right turn out from the first access point. This would not be provided and the actual turning movements are shown in **Figure 6-4**. This does not alter the outcomes of the impact assessment.

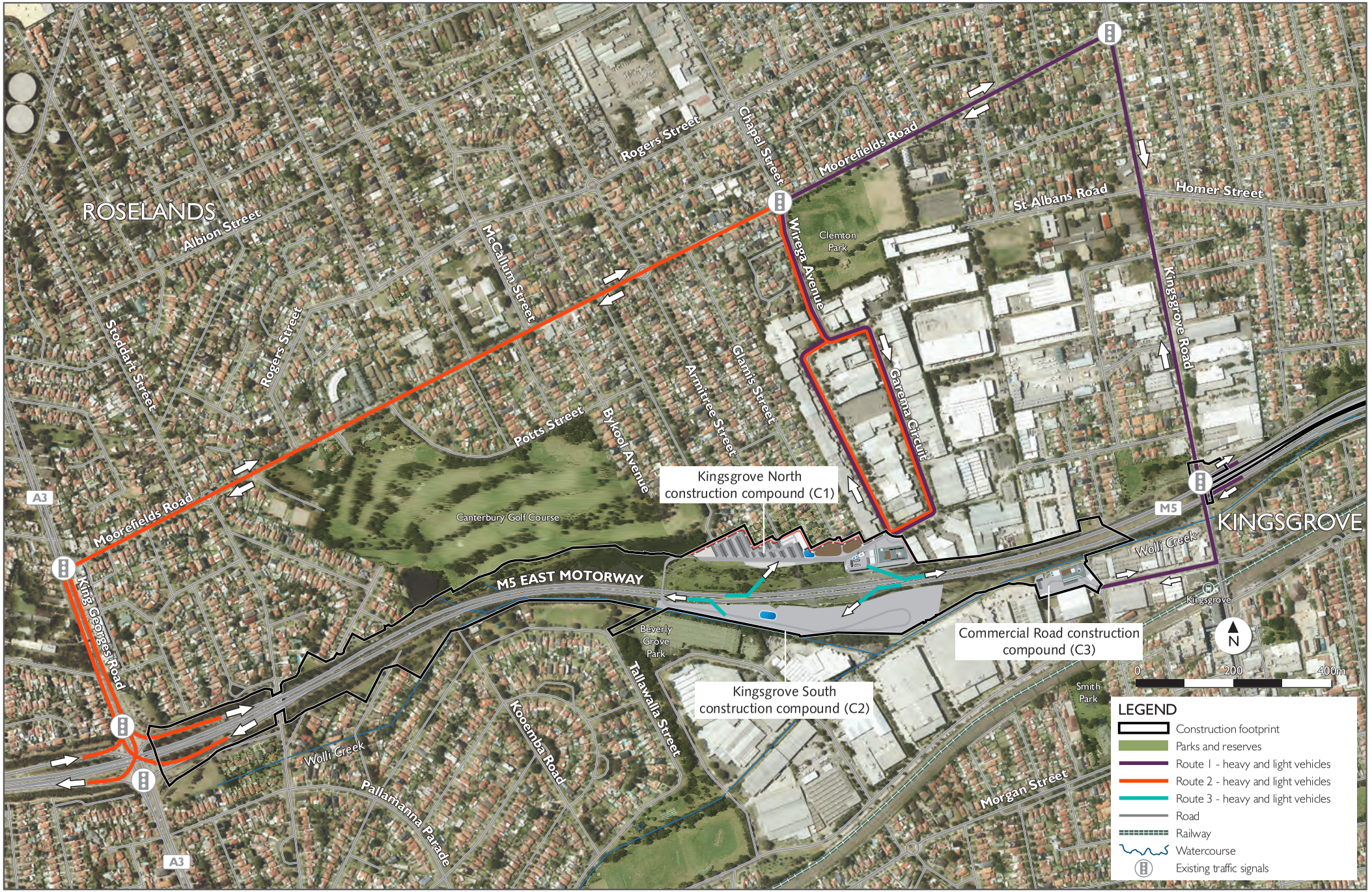

Figure 6-2 Kingsgrove North (C1), Kingsgrove South (C2) and Commercial Road (C3) construction compound vehicle routes

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Figure 6-3 Arncliffe construction compound (C7) vehicle routes

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Figure 6-4 Canal Road construction compound (C8) vehicle routes

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6.2.6 Car parking

Section 6.6.1 of the EIS stated that parking would not be allowed off-site. The construction compounds for the project would be designed to provide off-street car parking facilities to minimise impacts on access and parking for local residents (refer to Section 9.4 of the EIS). Parking by construction workers on local streets would be discouraged, and would be regularly reinforced through project inductions and toolbox talks. Construction personnel would be encouraged to use public transport where possible, and consider other modes of transport such as carpooling. These strategies would form part of the Traffic Management and Safety Management Plan, and environmental management measure TT01 has been amended to include this requirement (refer to **Chapter 8** (Revised summary of environmental management measures) of this report.

6.3 Traffic and transport

6.3.1 Road classifications

In Section 5.3.1 of Appendix G (Technical working paper: Traffic and transport) of the EIS, Campbell Road and Bourke Street are described as regional roads and should have been identified as collector roads.

6.3.2 Bourke Road / Bourke Street / Gardeners Road intersection

Table 94 of Appendix G (Technical working paper: Traffic and transport) of the EIS described the intersection design of the Bourke Road / Bourke Street / Gardeners Road intersection. This has since been clarified. The description provided in Table 5-6 of the EIS is correct and is reproduced in **Table 6-4**. This issue was not contained within the traffic model and as such does not have any implication on the findings of the EIS.

Table 6-4 Bourke Road / Bourke Street / Gardeners Road intersection works

Intersection	Upgrade works
Bourke Road / Campbell Road (extension)	• A new signalised T-intersection at the junction of the Campbell Road extension and Bourke Road • Bourke Road northbound would include two through lanes and one right-turn lane • Bourke Road southbound would include one left-turn lane and one right-turn lane • Campbell Road would include one left-turn lane and two through lanes.
Bourke Road / Bourke Street / Gardeners Road	• Bourke Street northbound would be widened from one lane to three lanes and would include one combined left / through lane, one through lane and one right-turn lane • Bourke Road southbound would be widened from two to four lanes and would include one dedicated left-turn lane, one through lane and two right-turn lanes • Gardeners Road eastbound would include one shared left-turn / through lane and two through lanes • Gardeners Road westbound would be widened from three lanes to four to provide an additional right-turn lane into Bourke Road northbound

6.4 Air quality and human health

6.4.1 Sensitive receivers

For the purposes of the air quality and human health risk assessment, sensitive receivers were classified as RWR (Residential, workplace and recreational) receivers or 'Community receivers'. Both types of receivers were assessed in each assessment. However, community receivers were subject to a more detailed approach to the assessment, which involved the combination of the contemporaneous road/outlet time series of concentrations from GRAL and the background time series of concentrations (refer to Section 5.5.3 of Appendix H (Technical working paper: Air quality).

Around 35 community receivers were included in the air quality and human health risk assessment, with the number of receivers being dictated by the limit on the number of time series of concentrations (eg the 1 hour mean of each hour of the year) that could practically be used in the dispersion model. As such, the 35 community receivers were a representative list of this type of receiver in the study area. The list was not intended to comprise an exhaustive list of all community receivers within the study area.

The St Peters pre-school, located adjacent to St Peters Public School was not identified being separate from public school campus within the EIS. For the purposes of the air quality and human health impact assessment, St Peters Public School was classified as a community receiver. The Babies Oasis (a day care centre) in Kingsgrove, located near the Bexley Road surface works area, was also not classified as a community receiver.

The St Peters preschool property and the Babies Oasis receivers were identified as a RWR receiver and as such have been assessed in the air quality and human health risk assessment. However, the receivers were not explicitly assessed as a community receptor.

However, as noted earlier, the list of community receivers was a representative sample of this type of receiver within the study area. As such, the results for St Peters Public School, located directly adjacent to the pre-school, can be taken as the indicator for potential impacts as a result of the project at this receiver. The closest community receiver considered in the air quality and human health risk assessment to Babies Oasis day care centre was the Kids Oasis child care centre in Kingsgrove.

Further, the human health risk assessment has included detailed calculations for the maximum impacted location from all RWR receivers within the study area and assumed that this location may be used for residential purposes but covers other sensitive uses such as pre-schools and schools.

As such, the assessments remain valid and no further assessment is considered necessary.

6.5 Noise and vibration

6.5.1 Construction noise and vibration

Vibration criteria

Section 4.4.1 of the Appendix J (Technical working paper: Noise and vibration) of the EIS outlined the criteria that would apply during blasting activities.

The criteria stated in *Australian Standard 2187.2-2006 Explosives – Storage and Use Part 2: Use of Explosives* – Appendix J have been used. These are first presented in *Australian Standard 7385.2-1993 Evaluation and measurement for vibration in building – Part 2 – Guide to damage levels from groundborne vibration*. The proposed criteria are consistent with other projects recently approved by the Department of Planning and Environment.

As discussed in the Technical working paper: Noise and vibration, it is noted that the values in Table 25 are less stringent than those in DIN4150. This is because DIN4150 considers resonance in buildings from continuous vibration. Due to the short duration of blasting events the propensity for resonance within buildings is minimal, giving rise to higher criteria. AS7385.2 notes that a building of historical value should not be assumed to be more sensitive unless it is structurally unsound.

Appendix R (Technical working paper: Non-Aboriginal heritage) of the EIS, when identifying the applicable criteria for blasting, references the DIN4150 criteria, which applies to a continuous vibration source. As such, the clarification is that the criteria that apply to blasting are shown in Table 25 of Technical working paper: Noise and vibration, as reproduced below (**Table 6-5**). Criteria based on DIN4150 will continue to apply for continuous vibration sources (such as tunnelling).

As noted in Technical working paper: Non-Aboriginal heritage, the impacts from blasting are largely dependent on the blast methodology. The size of the charge, spaces between the charge and timing between charges results in a large variability in the vibration generated by a blast. This variability necessitates the use of a specialised blast consultant to design blasts to achieve compliance with the applicable criteria. The need to consider sensitive structures such as heritage buildings would be considered in the blast strategy. Further, site investigations will be conducted prior to production blasting to define suitable blast sizes to comply with project blasting noise and vibration criteria (environmental management measure NCV27).

Table 6-5 Blasting ground vibration criteria summary

Category	Human comfort	Structural damage[1]
Sensitive structures (eg residential, theatres, schools etc.)	5 mm/s for 95% blasts per year 10 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply[2]	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Occupied non-sensitive structures of reinforced concrete or steel construction (eg factories and commercial premises)	25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacture's specifications or levels that can be shown to adversely affect the equipment operation.	50 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply*
Occupied non-sensitive structures that include masonry, plaster and plasterboard in their construction (eg factories and commercial premises)	25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacture's specifications or levels that can be shown to adversely affect the equipment operation.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Unoccupied non-sensitive structures of reinforced concrete or steel construction (eg factories and commercial premises)	N/A	50 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply*
Unoccupied non-sensitive structures that include masonry, plaster and plasterboard in their construction	N/A	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Services structures, such as pipelines, powerlines and cables	N/A	Limit to be determined by structural design methodology. Special consideration may be required for high pressure gas pipelines.

Note 1: The values above are less stringent than those in DIN4150. This is because DIN4150 considers resonance in buildings from continuous vibration. Due to the short duration of blasting events the propensity for resonance within buildings is minimal, giving rise to higher criteria.

Note 2: The blast vibration criteria identified in the ANZEC are considered conservative and were originally developed to protect communities exposed to long-term blasting operations such as mining sites. For projects such as this, with a shorter duration of blasting of 2 months or less, a higher vibration criterion may be reasonable. For this project, the location of the blast moves along the alignment such that any one receiver is affected for short period of time. Table J4.5(A) in Appendix H of AS2187 presents vibration limits designed to safeguard human comfort in relation to blasting that have been used by some authorities, as it defines clearer vibration limits which are dependent on the specific duration of the project. Based on the limitations of the ANZEC guideline and further guidance in AS2187, a human comfort vibration limit of 10 mm/s (peak particle velocity) for blasting operations lasing less than 12 months has been adopted for this project.

Construction noise assumptions

Table 34 of Appendix J (Technical working paper: Noise and vibration) of the EIS provides the sound power level assumptions for the assessed construction scenarios. The water treatment plant pump sound power levels differed between scenarios. A typographical error has resulted in note 2 of Table 34 being incorrectly associated with the water treatment plant pump in the 'General worksite and car park generation operations activity' on page 71 of the report. However, it is clarified that the correct sound power level was used in the noise impact assessment (being 97 dB(A)) and therefore predicted noise levels are correct for this activity.

6.5.2 Operational noise

At-source mitigation

Section 12.5.2 of the EIS states that the project has been designed to include the following pavement types:

- Dense graded asphalt at the St Peters interchange and local road upgrades
- Open graded asphalt for the main alignment tunnels, on and off ramps and M5 East Motorway integration works.

Concrete pavement would be used within the main alignment tunnels. Open graded asphalt would be used for the New M5 on the on- and off-ramps at the western portal starting at the point of the tunnel 'daylighting'. This clarification is consistent with the noise modelling completed for the project and as such, does not alter the assessment outcomes presented in the EIS.

Noise sensitive receivers eligible for consideration of additional noise mitigation

Section 12.5.2 of the EIS, Section 8.1 of Appendix J (Technical working paper: Noise and vibration) and Appendix M of Appendix J of the EIS identified noise sensitive receivers that would be considered eligible for consideration of additional noise mitigation.

The number of receiver locations which require further consideration of feasible and reasonable noise mitigation would be confirmed during detailed design, including further operational road traffic noise assessment where required. Confirmation of receivers eligible for consideration of at-property acoustic treatment may result in minor changes to the number and location of receivers.

Table 90 and Table 111 of Appendix J of the EIS (and the corresponding Appendix M of the technical working paper) identified residential receivers eligible for consideration of additional mitigation measures within the St Peters interchange and local road works study area. Since finalisation of the EIS, two discrepancies within these tables have been identified:

- ID4059, which had a listed street address of 8/635 Gardeners Road
- ID3855 and ID3567, both have a listed street address of 1/12 Brown Street, St Peters.

At this stage of the assessment, the buildings only (and not individual units) have been identified for consideration for noise mitigation.

With respect to 12 Brown Street, St Peters, the study has identified two buildings located at 12 Brown Street, St Peters, and these were assessed with both being identified as residential. The main building has slightly lower noise levels as it is partially shielded from the project by the building located at 10 Brown Street. A building with higher noise levels is located towards the rear of the property. This building has been identified as residential as the use cannot be determined from the road or aerial photography. Treatment would only be provided for habitable spaces. If the use of the rear building is found to be a shed or similar, this building would not be provided architectural treatment

In addition, the EIS identified two school buildings at the St Peters Public School as being eligible for consideration of noise mitigation during the daytime only. One of these buildings is in fact the St Peters Community Pre-school (with frontage at 18 St Peters Street, St Peters and Church Street), would be eligible for consideration of noise mitigation for internal and external areas of the property. This clarification does not alter the outcome of the assessment or recommendations.

In summary:

- At this stage of the assessment, individual units have not been identified as being eligible for consideration of noise mitigation
- St Peters Community Preschool at 18 St Peters Street, St Peters and one building at St Peters Public School would be eligible for consideration of noise mitigation during the daytime only
- The list of receivers identified in the EIS as being eligible for consideration of at-property acoustic treatment may change as a result of the detailed design process
- Consideration would be given to at-property acoustic treatments to all levels of multi-storey residential dwellings exceeding NSW Road Noise Policy assessment criteria during detailed design. This consideration would include a feasible and reasonable review of at-property treatments to confirm the effectiveness of any treatments in reducing noise
- ID4059 should be read as 635 Gardeners Road
- Both ID3855 and ID3567 relate to 12 Brown Street, St Peters until confirmation on the use of the structure is confirmed.

Miscellaneous

Two additional sensitive receivers were not correctly identified within the Technical working paper: Noise and Vibration. These were:

- Our Lady of Fatima Primary. This receiver had been identified as St Ursula's College. The assessment assumed the correct use of the building and does not alter the impact assessment outcomes for the project
- Babies Oasis, a day care centre on Kingsgrove Ave, Beverly Hills. This receiver had been classified as residential. This receiver is outside the operational noise study area but may be impacted by construction noise. Reasonable and feasible noise mitigation would be further considered during the preparation of the Construction Noise and Vibration Management Plan.

Further, Table 90 of the Technical working paper: Noise and vibration contained a typographical error, stating that it was presenting the $L_{Aeq(9hr)}$ suggesting night-time road traffic noise levels. In fact, it was presenting the predicted Daytime $L_{Aeq(15hr)}$ road traffic noise levels.

6.6 Land use and property

Appendix D1 (Properties affected by acquisition) of the EIS identified the properties that would be impacted by acquisition or temporarily occupied during construction. This includes properties that would be impacted in full or by partial acquisition. This appendix informed the property and land use, and social and economic impact assessments within the EIS.

Some properties along the Princes Highway (ID 74, 76, 77, 78, 81 and 88) were erroneously identified as residential, when in fact these contain commercial or mixed uses (eg some properties contain commercial on the ground floor and residential on the upper storeys). One property (ID 88) was also identified as commercial, when it has a current land use of residential. These corrections do not significantly alter the conclusions or recommendations of the impact assessments contained in the EIS.

6.7 Soil and water quality

Environmental management measure SW12 identified that re-fuelling, wash down and preparation of construction materials would be undertaken in bunded areas to mitigate risks in relation to spills or leaks of fuels / oils or other hazardous onsite construction material.

The requirement for refuelling to only occur within bunded areas is unlikely to be practical during construction activities, as refuelling of mobile items of plant and equipment may be required within construction zones outside of construction compounds. In these instances, refuelling would be undertaken by mobile mini-tankers via hand held hoses and would not occur within 40 metres of a watercourse. Specific refuelling procedures would be in place and operators would be trained in these procedures to manage risk and to manage any spills. Spill kits would also be available during these activities. However, to manage risks to the Green and Golden Bell Frog, refuelling at the Arncliffe construction compound (refer to **Section 7.1** of this report) would only occur within a specified bunded refuelling area.

Environmental management measure SW12 has been amended to reflect this clarification.

7 Preferred infrastructure report

This chapter has been prepared to outline and assess the impact of project amendments that have been identified to minimise environmental impacts or to deal with any other issue raised during the exhibition of the environmental impact statement (EIS) for the New M5 project (the project).

As outlined in Chapter 5 (Project description) of the EIS, the project description is based on the preferred design and will be refined during detailed design. Accordingly, this chapter explains changes or refinements that have been identified to minimise environmental impacts and to deal with issues raised during exhibition.

7.1 Marsh Street ponds

7.1.1 Description of changes

The Green and Golden Bell Frog Plan of Management identified the provision of new additional habitat at Marsh Street (refer to Appendix S of the EIS) as part of a broader package of mitigation and management measures to support the long term survival of the local population by expanding and enhancing the habitats available for the species. This additional habitat is referred to as the Marsh Street ponds. Further information about design and environmental impacts of the ponds are provided in this section.

The Marsh Street ponds would be located on a parcel of land to the east of the Marsh Street and West Botany Street intersection (the site) (**Figure 7-1**). The site is owned by Roads and Maritime Services (Roads and Maritime).

The Marsh Street ponds would consist of:

- Three Green and Golden Bell Frog ponds, located along the western boundary of the site consisting of:
  - One pond of around 1.5 metres in depth, about 25 metres long, which has been designed to provide refuge habitat
  - Two ponds of around 0.8 metres in depth, about 20 metres long, which have been designed to provide suitable breeding habitat.
- Water supply systems, including a header tank (with capacity of around 200 kilolitres), pipes and a drainage swale to fill and drain the ponds
- A serviced work shed, around 10 square metres, to support maintenance and monitoring activities and to store equipment
- Perimeter fencing, designed to enable frog passage along the eastern and northern perimeter of the site, and to prevent frog passage along the southern and western perimeter
- Permanent vehicle access off Eve Street.

A concept design for the Marsh Street ponds is provided in **Figure 7-1**.

The larger and deeper pond has been designed as the refuge pond and would be the only pond that would permanently contain water. The two smaller ponds would vary considerably in water depth during each season (by water management) and may even be allowed to become dry for short periods of time. A rock platform with fixing for a small outboard motor is to be provided in each pond, extending into open water for pond mixing.

The edges of clay lined ponds would be planted with aquatic macrophytes. Pond banks and areas between the ponds would be planted with suitable plant species to provide shelter, foraging and dispersal habitat for the Green and Golden Bell Frog. Sandstone rocks would also be placed at suitable locations within the site to provide refuge close to the ponds.

To the south and east of the three ponds, a drainage and habitat swale would be created. This swale would be capable of receiving water from two of the three ponds via a piped drainage outlet. Drainage from the larger pond (when required) would be undertaken by an external pump. The swale would be of a suitable size to allow for ponds to be periodically drained, while being able to withstand erosion. This swale would be planted with species suitable for shelter and foraging habitat.

The water source for the ponds, and suitability of the source for this purpose, would be confirmed during detailed design. Potential sources (in order of preference) include:

- Stormwater harvesting via connections to Rockdale City Council's stormwater system at Eve Street
- Potable water. A connection to the Sydney Water main could also be constructed to provide a supply, or in the case of stormwater harvesting, a backup supply to the ponds during dry periods
- Treated groundwater from the permanent water treatment plant located at the Arncliffe motorway operations complex (C7).

Water discharged from the site would eventually flow through land owned by Rockdale City Council; into an existing vegetated drain which formed part of the original Marsh Street wetland, which flows into the Eve Street wetland (a Sydney Water asset). Overflow water from the Eve Street wetland is discharged also via an open drain into Muddy Creek (near its junction with the Cooks River).

Consultation with Rockdale City Council would continue during detailed design to ensure that the conveyance of water through its land is appropriately managed.

Roads and Maritime would also consult with Sydney Water with respect to connections to the water main, if required. Any works would be in accordance with Sydney Water's requirements.

The management protocols for the Marsh Street ponds have been detailed in a Green and Golden Bell Frog Habitat Creation and Captive Breeding Plan (Eco Logical Australia, 2016a), which is provided in **Appendix B** of this report. This plan details the management protocols for the site during construction and operation. This includes (but is not limited to):

- Dosing the ponds with salt (sodium chloride) to control Chytrid disease (Chytrid is a skin fungal disease that can wipe out frog populations)
- Control of pond water levels
- Drainage of individual ponds for vegetation management to promote dieback and regrowth of aquatic macrophytes, and plague minnow control to ensure that pond communities do not become diverse and unsuitable for the frogs
- Vegetation management for the removal of trees to ensure adequate access to sunlight.

The design of the ponds is subject to detailed design, but would be consistent with the requirements of the Green and Golden Bell Frog Habitat Creation and Captive Breeding Plan.

The Marsh Street ponds would be managed for conservation in perpetuity, such as through a biobanking agreement or through a community trust. The long term management framework would be determined in consultation with Rockdale City Council.

Figure 7-1 The Marsh Street ponds (indicative)

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Construction

Construction of the Marsh Street ponds would take around six months to complete, and is expected to be completed no later than the end of 2019 (refer to **Table 7-1**). Works would occur during standard construction hours (Monday to Friday 7am to 6pm, Saturday 8am to 1pm).

Table 7-1 Indicative construction program (Marsh Street ponds)

Construction activity	Indicative construction timeframe (month)					
	1	2	3	4	5	6
Site establishment						
Pond construction works						
Plantings, construction of supporting infrastructure and landscaping						
Demobilisation						

A construction compound would not be established at the site. Any required construction support would be from the Arncliffe construction compound (C9). Amenities would be provided at the site (such as a temporary office and portable toilet).

Site access would be provided off Eve Street, with construction vehicles accessing the site via the Eve Street / West Botany Road intersection and exiting via the same intersection, West Botany Street and Wickham Street. During the peak construction period, around 10 movements (or five vehicles) per hour would be generated. The construction footprint and site access routes for the site are depicted in **Figure 7-2**.

Opportunities to minimise vegetation clearance within the construction footprint would be explored during detailed design.

The key construction activities at the site would include:

- Site establishment including vegetation removal
- Bulk earthworks to form the three ponds and drainage network
- Stockpiling of materials and spoil
- Construction of the work shed, site access point and fencing, including a limited area of hardstand
- Utility connections, including stormwater, potable water (including installation of a header tank), sewer and electricity
- Landscaping and rehabilitation
- Demobilisation.

A 1.8 metre high hoarding would be provided along the Eve Street perimeter of the site. The existing road noise barriers along Marsh Street would not be impacted by the construction activity.

Excavated spoil, in excess of site requirements or spoil not suitable for re-use would be temporarily stockpiled on site prior to removal. Spoil would be managed in accordance with the Spoil Management Plan for the overall project.

The potential for encountering contaminated and acid sulfate soils during bulk earthworks would be confirmed during detailed design and management measures implemented to manage potential odour, soil and water quality impacts.

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Figure 7-2 The Marsh Street Ponds - Construction footprint

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7.1.2 Environmental overview of changes

As identified in **Section 7.1.1** of this report, the Green and Golden Bell Frog Plan of Management identified the provision of additional habitat at the site. However, no design detail was available at time of the EIS preparation.

The design of the proposed Marsh Street ponds has now been progressed as part of the project and a review of the potential impacts associated with the construction and operation of the ponds has been undertaken. This review has concluded that the construction and operation of the Marsh Street ponds would result in changes to:

- Construction traffic and transport impacts. Further assessment of the construction traffic and transport impacts has therefore been conducted and is included in **Section 7.1.3**
- Construction noise and vibration impacts. Further assessment of the construction noise and vibration impacts has therefore been conducted and is included in **Section 7.1.4**
- Surface water and flooding. Further assessment of the potential surface water and flooding impacts has therefore been conducted and is included in **Section 7.1.5**
- Biodiversity. Further assessment of the potential biodiversity impacts has therefore been conducted and is included in **Section 7.1.6**.

The review has also considered the potential for the Marsh Street ponds to have the following impacts: air quality (dust and odour), visual impact and urban design, social and economic, soil and groundwater, non-Aboriginal heritage, Aboriginal heritage and resource use and waste minimisation. These matters have been considered in **Section 7.1.7**.

7.1.3 Traffic and transport

An addendum traffic and transport assessment has been prepared having regard to the construction of the ponds (Marsh Street ponds – Traffic and transport impact assessment (AECOM, 2016a)). This section summarises the findings of the assessment, and the full report is provided in **Appendix D** of this report.

This assessment is to be read in conjunction with the Technical working paper: Traffic and transport (Appendix G of the EIS) which contains detailed descriptions and explanations of the assessment guidelines and methodologies used.

As the operation of the Marsh Street ponds would only involve minor maintenance activities, with infrequent and minor traffic generation, an assessment of the operational traffic impacts has not been undertaken.

Existing environment

Volumes and roadway performance

The existing traffic volumes and mid-block performance on West Botany Street adjacent to the site was assessed in two locations:

- Between Marsh Street and Wickham Street
- Between Wickham Street and Brennans Road.

Table 7-2 provides a summary of the existing traffic volumes and mid-block performance at the two locations.

In the AM peak hour, northbound traffic on West Botany Street (between Marsh Street and Wickham Street) exceeded road capacity with a mid-block volume to capacity (V/C) ratio of 1.06 and a level of service (LoS) of F. In the PM peak hour, the southbound traffic on West Botany Street (between Wickham Street and Brennans Road) performs poorly, with a midblock V/C ratio of 0.87 and LoS E.

Table 7-2 Existing mid-block performance (2016 without construction)

Location	Direction	Mid-block capacity	Light vehicles	Heavy vehicles	V/C	LoS
AM Peak Hour						
West Botany Street (Marsh Street – Wickham Street)	NB	2400	2310	92	1.06	F
	SB	3600	734	72	0.26	A
West Botany Street (Wickham Street – Brennans Road)	NB	2400	761	31	0.35	B
	SB	2400	419	26	0.20	A
PM Peak Hour						
West Botany Street (Marsh Street – Wickham Street)	NB	2400	988	44	0.46	C
	SB	3600	2729	49	0.79	D
West Botany Street (Wickham Street – Brennans Road)	NB	2400	604	21	0.27	B
	SB	2400	2037	24	0.87	E

Intersection performance

The existing performance of intersections in the vicinity of the ponds was assessed in two locations:

- Wickham Street / West Botany Street
- Marsh Street / West Botany Street.

The results are provided in **Table 7-3**. While both intersections appear to perform well, they were observed to be congested during the peak hours.

Table 7-3 Existing intersection performance (2016 without construction)

Intersection/peak	Light vehicles	Heavy vehicles	Average delay (s)	LoS
Wickham Street / West Botany Street				
AM Peak	2893	157	23	B
PM Peak	4175	82	12	A
Marsh Street / West Botany Street				
AM Peak	3359	203	7	A
PM Peak	3500	111	11	A

Public and active transport

Operational bus routes in the vicinity of the ponds include:

- Route 400 (Bondi Junction to Burwood) - travels along Marsh Street and Wickham Street at a frequency of every 10 to 20 minutes during weekday peak hours
- Route 410 (Bondi Junction to Rockdale) - which travels along Marsh Street and Wickham Street at a frequency of every 20 to 30 minutes during weekday peak hours
- Route 422 (Tempe / Kogarah to Sydney) - travels along the Princes Highway and West Botany Street at a frequency of every 10 to 15 minutes during weekday peak hours.

Roads and Maritime is currently widening Marsh Street which would include the provision of a cycle path on the southern side of the street. This would link into the existing Eve Street Cycleway which runs along the north-eastern side of the M5 East Motorway adjacent to the Kogarah Golf Course, before passing under the motorway near the Eve Street wetland and continuing south towards Banksia Grove.

Assessment of potential impacts

Access to the site would be via Eve Street, with construction vehicles entering the site by turning left from Marsh Street onto Eve Street and exiting the site onto Marsh Street via Eve Street (left out only). Vehicles would then travel away from the site via Wickham Street.

During the peak construction period, it is anticipated that construction traffic would have no more than a minor impact on the local road network. Around ten road traffic movements per hour would be generated during the AM and PM peak with three light vehicles and two heavy vehicles expected to enter and exit the site.

Table 7-4 provides a summary of mid-block performance levels during construction. Construction traffic would result in a small increase in mid-block traffic, a minor change in V/C ratios and no change in the mid-block LoS. The impacts on local road traffic operations would be minimal with a change in V/C ratio of one per cent or less. This change would fall within the daily variation in vehicle volume and performance. No further analysis of traffic impact has therefore been undertaken.

Table 7-4 Mid-block performance during construction

Location	Direction [1]	Mid-block capacity	Light vehicles	Heavy vehicles	V/C	V/C % change	LoS
AM Peak Hour							
West Botany Street (Marsh Street – Wickham Street)	NB	2400	2310	92	1.06	No change	F
	SB	3600	737	74	0.26	<1.0%	A
PM Peak Hour							
West Botany Street (Marsh Street – Wickham Street)	NB	2400	988	46	0.46	No change	C
	SB	3600	2732	51	0.79	<1.0%	D

Note 1: NB = northbound, SB = southbound

Given the minor impact of construction traffic on the local road network and general traffic movements, construction activities are likely to have minimal impact on public transport operations. Further, given the peak construction period for the Marsh Street ponds would not coincide with the peak construction period for the total project, the project (as amended) would unlikely increase the predicted traffic impacts as presented in the EIS.

The volume of construction vehicles associated with the Marsh Street ponds is low and as such would present a minor risk to cyclists accessing the Eve Street Cycleway via West Botany Street. Any conflict would be managed by the recommended environmental management measures.

Environmental management measures

Based on the outcomes of this assessment, the findings are consistent with the Technical working paper: Traffic and transport. Provided the management measures outlined in **Chapter 8** (Revised environmental management measures) of the EIS are implemented, no significant impact on the local road network is anticipated. This includes:

- TT01 – Construction Traffic Management and Safety Plan (CTMSP) would be prepared as part of the CEMP. The CTMSP would 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)
  - Traffic control devices such as traffic 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 compounds and the specific controls required at specific locations

- TT08 – Impacts on pedestrian paths and cycle lanes would be minimised, and alternatives provided during construction where practical and safe to do so
- TT12 – A road dilapidation report(s) would be prepared identifying existing conditions of local roads and mechanisms to repair damage to the road network caused by heavy vehicle movements associated with the project.

No additional environmental management measures are considered necessary to mitigate the potential traffic and transport impacts.

7.1.4 Noise and vibration

An addendum noise and vibration assessment was undertaken for the construction of the ponds (Marsh Street ponds – Noise and vibration impact assessment (AECOM, 2016b)). This section summarises the findings of the assessment, and the full report is provided in **Appendix D**. The following impacts were not considered as part of the assessment:

- The risk of vibration induced human discomfort, regenerated noise and structural damage is extremely low. The construction works would involve low vibration intensive equipment, which would not operate within close proximity to the nearest residential building or occupied structure. That is, works would occur within safe working distances. Therefore vibration impacts are not considered further in this assessment.
- As the operation of the project would only involve minor and infrequent maintenance activities, an assessment of the operational impacts has not been undertaken
- As construction works would only occur within standard construction working hours and no night works would be required, sleep disturbance has not been considered further in this assessment

This assessment is to be read in conjunction with the Technical working paper: Noise and vibration (Appendix J of the EIS) which contains detailed descriptions and explanations on the assessment guidelines and methodologies used.

Existing environment

Background noise surrounding the site is largely influenced by heavy traffic flows along Marsh Street, West Botany Street, Princes Highway and the M5 East Motorway. Sydney Airport is located to the east and as such, aircraft noise is also a key source of noise for receivers within this area.

Sensitive receivers in proximity to the site are predominantly residential properties located along West Botany Street, the north-western side of Marsh Street and on both sides of Eve Street and Brennans Road. These receivers generally comprise single and double storey individual houses. Kogarah Golf Course is located to the east of the Marsh Street interchange of the M5 East Motorway.

No other sensitive receivers, such as places of worships, schools and child care centres were identified in the area.

The area surrounding the site has been divided into the three following distinct noise catchment areas (NCAs):

- NCA 12 – Around 120 metres to the north of the Marsh Street ponds site
- NCA 13 – The area including and immediately adjacent to the Marsh Street ponds site
- NCA 14 – Around 90 metres to the south of the Marsh Street ponds site

The NCAs are consistent with the NCAs presented in the Technical working paper: Noise and vibration (Appendix J of the EIS).

Ambient noise monitoring was undertaken from 12 June 2015 to 25 June 2015 (completed as part of the EIS assessment for the Arncliffe surface works) at three locations to quantify the existing background noise environment for surrounding receivers. **Table 7-5** provides a summary of the attended noise measurements.

Table 7-5 Ambient noise measurements

NCA	Address of logger	Rating background level, dB(A)			Ambient L_{Aeq} noise level, dB(A)		
		Day $L_{A90(15\ minute)}$	Evening $L_{A90(15\ minute)}$	Night $L_{A90(15\ minute)}$	Day $L_{Aeq(15\ hour)}$	Evening $L_{Aeq(4\ hour)}$	Night $L_{Aeq(9\ hour)}$
12	20 Marsh Street, Arncliffe	55	56	45	61	62	59
13	6 Eve Street, Arncliffe	49	48	42	54	55	50
14	25 Firmstone Garden, Arncliffe	47	48	39	55	54	50

The noise levels presented in the table above indicate that the noise environment at the measurement locations is typical of urban noise environments that have through traffic with characteristically heavy and continuous traffic flows during peak periods. Day time and evening background noise levels are high due to heavy and continuous traffic flows. The night time background noise levels tend to decrease as a result of reduced traffic flows.

Assessment of potential impacts

Construction of the ponds would take place within and adjacent to existing residential areas in the vicinity of the site. Construction related noise would impact on the acoustic amenity of receivers identified within the three NCAs. Construction noise would be produced from the following activities:

- Vegetation clearing (shredding and stump grinding)
- General construction activities (excavation, compaction, operation of plant and equipment, construction vehicle movement and delivery and removal of materials).

The *Interim Construction Noise Guideline* (DECC, 2009) sets out noise management levels (NMLs) and how they are applied to surrounding residential receivers. The NMLs for various NCAs during the construction of the project are shown in **Table 7-6**. As the construction would occur during standard hours, the NML for standard (daytime) hours was assessed.

The predicted noise levels as a result of construction activities are also provided in **Table 7-6**. This table presents the median construction noise level (typically the noise level two to three rows of houses behind the construction works) and the highest predicted construction noise levels for each noise catchment area (typically the row of houses closest to the construction works). The tables also presents the number of receivers where the construction noise levels are predicted to exceed the applicable NML and the number of receivers predicted to be highly noise affected level for each noise catchment area. The predicted construction noise levels are also provided graphically in **Appendix D**.

Table 7-6 Noise management levels and predicted noise levels during construction

NCA	Noise management level L_{Aeq} dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Vegetation clearing						
NCA12	65	42	54	0	0	0
NCA13	59	52	78	19	14	1
NCA14	57	45	62	5	6	0
General construction activities						
NCA12	65	41	53	0	0	0
NCA13	59	51	77	18	13	1
NCA14	57	44	61	4	4	0

Based on the worst case predicted noise level, the noise levels within NCA 12 would comply with the NML for all construction activities.

Some receivers within NCA 13 and NCA 14 would experience noise levels in exceedance of their respective NMLs during the vegetation clearing and general construction activities. For the entire construction period, only one receiver is predicted to be highly noise affected. This receiver is within NCA 13, located on the same side of Eve Street as the site.

Vegetation clearing, which induces slightly higher noise levels than other works, would only occur for a short period of time at the beginning of construction. For the remainder of the construction period, all equipment would be unlikely to operate simultaneously as has been assessed. As such, the results presented are conservative and would not occur for the entire six month construction period.

The change in construction traffic noise along West Botany Street, as a result of the Marsh Street ponds, during the AM and PM peak is expected to be less than 2 dB(A). This is within the recommended construction traffic noise goal.

Existing road traffic volumes along Eve Street and Wickham Street were not available for completing a construction traffic noise assessment. The traffic volume along Eve Street is likely to be considerably lower than the surrounding road network. The noise environment at residential receivers along Eve Street is currently controlled by traffic on the surrounding road network. The Marsh Street ponds – Transport and traffic impact assessment (**Appendix C** of this report) identifies that the additional traffic volumes generated during construction of the ponds would likely have minimal impact on the road traffic volumes for Wickham Street, with an estimated one per cent or less change in traffic volumes. Therefore, an additional three light vehicles and two heavy vehicles, making ten movements in total, would not cause appreciable noise increases at residential receivers along Eve Street and Wickham Street.

With respect to cumulative impacts, there is the potential for construction activities at the Arncliffe construction compound (C9) to occur concurrently with the construction of the Marsh Street ponds. Predicted noise levels due to construction works at the Arncliffe construction compound have been provided in the Technical working paper: Noise and vibration (Appendix J of the EIS). Noise levels as a result of cumulative impacts could increase by up to 3 dB(A) above the maximum noise level predicted for the Marsh Street ponds works or the Arncliffe construction compound works. In addition, an increase in the frequency of potential construction noise impacts may occur.

However, these outcomes assume a worst case scenario, where all equipment is operating simultaneously and is positioned as close as possible within the construction footprint to surrounding receivers. Further, the construction areas (for the Marsh Street ponds and the Arncliffe construction compound) are separated by the M5 East Motorway. Given that the potential increase due to cumulative impacts is a maximum of 3 dB(A), which is widely accepted as being 'just perceptible', and is more likely to be less than 3 dB(A), it is not considered beneficial to provide further analysis at this stage. In any case all feasible and reasonable noise mitigation measures would be implemented and an increase of up to 3 dB(A) is unlikely to modify these mitigation measures.

Environmental management measures

Noise impacts associated with the construction of the Marsh Street ponds have the potential to temporarily impact surrounding receivers. However, impacts would be temporary, localised and limited to the standard working hours (Monday to Friday 7am to 6pm, Saturday 8am to 1pm).

Noise impacts would be managed through the implementation of the environmental management measures outlined in **Chapter 8** (Revised environmental management measures). This includes:

- NV1 (Construction Noise and Vibration Management Plan): This would include the identification of feasible and reasonable noise mitigation measures
- NV9 (Where feasible and reasonable, equipment with directional noise emissions will be orientated away from sensitive receivers): Noise associated with the construction site would primarily result from the operation of fixed and mobile plant and truck movements. Consideration would be given to the layout of the site in order to maximise distance and shielding to nearby receivers
- NV11 (Construction noise monitoring): A noise monitoring program would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress. This would form part of the Construction Noise and Vibration Management Plan
- NV16 (Respite periods for high noise impact works where possible): Respite measures may include the restriction to the hours of construction activities resulting in impulsive or tonal noise (such as shredding or stump grinding), or other appropriate measures agreed between Roads and Maritime and residential receiver. The protocol would form part of the Construction Noise and Vibration Management Plan
- NV17 (Designated vehicle routes, parking and queuing locations, acceptable delivery hours and other relevant practices)
- NV18 (Deliveries and spoil removal will be planned to avoid queuing of trucks around sites)
- NV20 (Safe working distances)
- NV30 (Community consultation) in addition to commitments within the New M5 Draft Community Consultation Framework (Appendix E of the EIS).

However, the following amendment (shown in bold text) has been made with respect to NV7 to reflect the need to provide hoarding at the Marsh Street ponds site during construction (refer to **Table 7-7**).

Table 7-7 Revised management measure for noise and vibration

Impact	No.	Environmental management measure	Timing
Construction noise	NV7	Temporary acoustic hoardings will be installed at the Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), **the Marsh Street ponds site**, Canal Road (C8) and Campbell Road (C9) construction compounds. The design and location of acoustic hoardings will be confirmed during detailed design.	Construction

7.1.5 Surface water and flooding

An addendum surface water and flooding assessment was undertaken for the project (Marsh Street ponds – Surface water and flooding impact assessment (AECOM, 2016c)). This section summarises the findings of the assessment and the full report is provided in **Appendix E**. This assessment is to be read in conjunction with the Technical working paper: Surface water (Appendix N of the EIS) which contains detailed descriptions and explanations on the assessment guidelines and methodologies used.

Existing environment

The site is currently a grassed vacant parcel of land that drains towards a constructed vegetated channel through the Marsh Street wetland (on land owned by Rockdale City Council), which in turn drains to Eve Street wetland, which is owned by Sydney Water, and on to the Cooks River. Five sub-catchments draining to the Eve Street wetland have been identified. The sub-catchments' properties are summarised in **Table 7-8**. The total catchment area draining to the Eve Street wetland is around 29.1 hectares, of which 8.7 hectares would potentially be part of the stormwater harvesting catchment associated with the site.

Table 7-8Sub-catchments draining to the Eve Street wetland

Catchment name	Sub-catchment area (hectares)	Impervious area (%)	Current catchment land use	Downstream catchment
E_01	12.1	20	Residential, maintained playing fields, wetlands.	N/A – flows to Cooks River via the channel
E_02	8.7	70	Residential, some commercial along the western portion of the catchment including motor vehicle workshops.	E_01 (Eve Street wetland)
M_01	1.5	15	Rehabilitated spoil, grass, some roads and abandoned houses	E_01 (Eve Street wetland)
M_02	6.3	70	Residential, some commercial along the western portion of the catchment including motor vehicle workshops.	M_01 (Marsh Street wetlands)
S_01	0.5	0	Grass with a few trees	M_01 (Un-named channel)

The site is located on the lower slopes of a hill that slopes upwards to the west towards the Princes Highway. As such, it is raised above adjacent swampy areas associated with the surrounding wetlands. Water from the site currently flows overland to a constructed channel through the Marsh Street wetlands to the east of the site. The Eve Street wetlands were constructed by Sydney Water as part of a stormwater management system.

The site is located above the 100 year average recurrence interval (ARI) flood level and is unlikely to be affected by local catchment flooding for all events up to and including the 100 year ARI. There is no upstream catchment that drains through the site at present. Kerb and gutter drainage is found along Marsh Street and West Botany Street, which collects water flowing along the road network upstream of the site, and directs it towards drainage pits that are part of the Eve Street catchment drainage network, or the Marsh Street catchment drainage network.

Assessment of potential impacts

Construction

Activities associated with the project that have the potential to impact surface water include:

- Construction of the ponds and the drainage swale
- Potential spills or leaks of fuels and / or oils from maintenance or re-fuelling of construction plant and equipment or vehicle / truck incidents
- Construction activities located within flood risk areas
- Generation of wastewater during construction.

These activities could expose underlying soils which could result in landform instability, sedimentation and a reduction in water quality.

Water use

Water will be required for a range of activities during construction, including compaction, dust suppression and washdown. Generally, water used for these purposes would be sourced from the Sydney Water potable supply network during construction. The water requirements associated with the construction of the Marsh Street ponds are expected to be minor. During establishment the ponds would require regular watering to support the growth of plants. Aquatic plants would require around twice the volume of water that terrestrial vegetation requires during establishment.

Flooding

As the site is located outside the Cooks River flood extent for events up to and including the 100 year ARI, construction is not expected to have an impact on mainstream flooding of the Cooks River. The site is also located outside local drainage corridors and as such, flooding during the construction activities is considered unlikely. Some minor works, such as the construction of a stabilised connection to the existing channel, are expected to take place within the drainage corridor subject to further discussions with Rockdale City Council.

Dewatering

There may be a need for dewatering during excavation from the inundation of rainwater within the partially completed ponds (subject to environment protection licence conditions). This water would need to be pumped into the channel or the existing stormwater drainage network. Such dewatering activities would be of short duration due to the limited extent of the works. Water from dewatering may have a greater sediment concentration than water from the undisturbed site. The Erosion and Sedimentation Management Plan would contain measures to manage the sediment associated with the pump out water. Further, the limited extent of works means that volumes would be small relative to the extent of groundwater that would be expressed in the downstream channel. Therefore, dewatering is unlikely to have an impact on flow variability that would be detrimental to the receiving environments.

Water quality

The erosion of soils by wind or rain may lead to water quality issues such as sedimentation in the receiving waters downstream. The construction of the drainage swale also has the potential to concentrate flows, which may exacerbate erosion. Soils transported into local waterways can impact water quality through increased turbidity, lowered dissolved oxygen levels, and increased nutrients (nitrogen and phosphorus). The sedimentation may smother aquatic ecosystems and increases in nutrients may contribute to eutrophication.

Following construction, erosion and sediment loads would gradually diminish as the disturbed areas are stabilised and revegetated. The risk of erosion during construction would be minimised by bringing the ponds online only after the landscape has established. This would ensure that the ponds would only be exposed to flows from external catchments after the landscape is fully stabilised.

Impacts associated with construction for the project would be managed via the implementation of environmental management measures outlined in **Chapter 8** (Revised environmental management measures). No additional environmental management measures are considered necessary to mitigate surface water and flooding impacts.

Operation

During operation, the project has the potential to result in the following impacts:

- Impact to water quality of receiving watercourses from the discharge of water from the ponds.
- Impact to the geomorphology of receiving watercourses resulting from changes in the frequency and / or velocity of flows.
- Flow entering the existing watercourses at a new location from the proposed ponds or swale.

Operation of the Marsh Street ponds has the potential to result in impacts to surface water as a result of the diversion of untreated stormwater through the ponds. Runoff from this catchment would typically contain pollutants such as nutrients, oils and greases, petrochemicals and heavy metals from atmospheric deposition, vehicle leaks, operational wear, road wear or spills of materials on the road. As stormwater passes through the ponds, pollutants would be removed from the water column by the treatment processes that are an inherent part of vegetated ponds.

Runoff from sub-catchment E_02 would be directed to the ponds. Preliminary modelling indicates that the Marsh Street ponds would improve the quality of the water passing through the ponds resulting in a net removal of pollutants of between six and 19 per cent depending on the pollutant. Gross pollutants such as leaves and litter would also be retained by the ponds. This pollutant removal represents a net benefit to the downstream environments.

The ponds will be periodically dosed with salt for the control of the Chytrid fungus (around six monthly intervals). After dosing, salinity levels would be temporarily as high as 3,000 milligrams per litre, thereafter dropping at a rate proportional with the amount of dilution created by catchment runoff.

The discharge of saline water from the ponds is not expected to impact the receiving environments for the following reasons:

- Saline incursions are a natural part of wetlands in the near-coastal environment, and most of the native species of these communities are tolerant of short-term brackish conditions
- The highest concentrations of salts are expected to be 3,000 milligrams per litre. The Marsh Street ponds themselves are not expected to be impacted by this salinity. At present saline dosing is carried out in the existing frog ponds associated with the M5 East Motorway. These ponds discharge to ponds on the Kogarah Golf Course, which in turn drain to the Cooks River. There are no apparent detrimental impacts to the aquatic macrophytes or frog populations associated with this dosing. Water discharged from the ponds would be diluted by catchment runoff prior to any discharge so that discharges to the receiving environments would be of a lower salt concentration
- The key receiving environment is the Eve Street wetland, which is a hyper saline environment.

Natural flow variability

During the operation, less than 30 per cent of the catchment draining to the Eve Street wetland would be available for stormwater harvesting, and only a fraction of the runoff from this catchment would be used in the ponds. As such, the cycles of stormwater and tidal flushing would only be altered in a minor way as the majority of the identified sub-catchments draining to the Eve Street wetlands would not be available for capture by the stormwater harvesting system.

The net change in flow volumes to the channel in the Marsh Street wetlands would be a reduction of less than 0.7 per cent, and flows to the Eve Street wetland would be reduced by less than 0.5 per cent as a result of diverting stormwater to the Marsh Street ponds. Such a small reduction in flows is unlikely to have a measureable impact on these receiving environments, since this change is much less than the natural variability in flows that these environments are subjected to.

Geomorphology

During operation the Marsh Street ponds have the potential to impact the geomorphology of receiving watercourses in the surface water study area. Impacts on watercourses could result from the discharge of drainage at new locations, for example, at the end of the swale, or as a result of increased discharges.

During detailed design, Roads and Maritime will consult with Rockdale City Council concerning the construction of appropriately designed connections to the existing watercourses through the Marsh Street wetlands to manage the risk or erosion in the operational phase, consistent with the measures provided in the **Chapter 8** (Revised environmental management measures) of this report.

Environmental management measures

Flooding impacts associated with the construction and operation of the Marsh Street ponds are unlikely as the site is located outside of the Cooks River floodplain, and, with the exception of the required connections, outside the existing drainage paths. The operation of the stormwater harvesting system is not expected to alter the frequency, volume or water quality of the inflows to the Eve Street wetland to a measurable extent. The risk of erosion during construction would be minimised by bringing the ponds online only after the landscape has established.

Following construction, appropriately designed connections to the existing watercourses through to the Marsh Street wetlands are recommended to manage the risk of erosion in the operational phase. This would be considered as part of the detailed design and in consultation with Rockdale City Council.

There is the potential for some geomorphological impacts and water quality impacts as a result of sediment runoff during construction, however these impacts are consistent with those identified previously in the Technical working paper: Surface water. Based on the outcomes of this assessment, there would not be a significant change to the surface water impacts as presented in the Technical Working Paper: Surface water (AECOM, 2015) and Technical working paper: Flooding (Lyall & Associates, 2015). No further mitigation and management measures are proposed in addition to those provided in the technical working papers and outlined in **Chapter 8** (Revised environmental management measures).

7.1.6 Biodiversity

A biodiversity assessment was undertaken to assess the ecological impact of the additional habitat created for the Green and Golden Bell Frog population in Arncliffe (Marsh Street ponds – Biodiversity impact assessment (Eco Logical, 2016b)). This section summarises the findings of the assessment and the full report is provided in **Appendix F**.

Existing environment

The site is an area of open, mowed grass with a dense stand of exotic weeds in the eastern part of the site. There are a few trees within the site that form part of the garden of the adjacent houses.

A field investigation was undertaken on 4 February 2016 to inform the biodiversity assessment. No indigenous native vegetation communities or threatened ecological communities listed under the *Threatened Species Conservation Act 1995* (TSC) or *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) were recorded within the site.

While no threatened flora or fauna were observed within the site, there is a low likelihood of Green and Golden Bell Frog at the site given the limited marginal foraging and dispersal habitat at the site.

Vegetation communities

Vegetation communities within the site were identified as:

- Exotic / weeds
- Exotic grassland (managed)
- Urban native and exotic cover.

The extent of the vegetation communities within the site is provided in **Figure 7-3**.

The open area of the site is dominated by exotic grassland (managed), where native diversity and ecological values were considered negligible. A number of common and noxious weeds were observed on the edge of the grassland boundaries.

Vegetation along the southern and eastern boundary of the site consisted of a number of exotic and non-indigenous native tree species, which are associated with the adjacent houses and Eve Street nature strip. A number of noxious weeds were present within the understorey of this community, including *Lantana camara* (Lantana), *Cestrum parqui* (Green Cestrum) and *Asparagus aethiopicus* (Asparagus Fern).

Flora

A total of 42 flora species were identified within the site, four of which were native species and 38 were exotic species.

No threatened flora species were identified during the field investigation, or have previously been recorded within the site. Given the current condition of the vegetation and disturbance, there is limited potential that threatened flora species would be present within the site.

One species that is listed as threatened under the TSC Act was found just outside the site. This species, *Eucalyptus nicholii* (Narrow-leaved Black Peppermint), has a natural range in the northern tablelands of NSW. The specimen observed would have been planted and would not be affected by the project.

Four exotic species recorded within the study area are declared as noxious under the *Noxious Weeds Act 1993* in the Rockdale local government area. Three species are listed as a Weed of National Significance (WoNS) (refer to **Table 7-9**). Noxious weeds require careful management to prevent spread into adjacent areas. Two other species of noxious weeds were recorded adjacent to the eastern boundary of the study area; *Celtis sinensis* (Chinese Celtis) and *Ligustrum lucidum* (Large-leaved Privet).

Table 7-9 Noxious and Weeds of National Significance (WoNS) species recorded within the site

Scientific name	Common name	NSW class	WoNS
Asparagus aethiopicus	Asparagus Fern	Class 4	Yes
Asparagus plumosus	Climbing Asparagus Fern	Class 4	Yes
Cestrum parqui	Green Cestrum	Class 3	No
Lantana camara	Lantana	Class 3	Yes

Fauna

No threatened fauna were identified during the field investigation or have previously been recorded within the site. Given the land management practices (mowing) and the disturbed condition of the vegetation and habitat, there is limited potential that native fauna species outside of common, disturbance tolerant species would be present within the site. Only common and urban tolerant fauna have been observed within the site and include Black Rats, European Red Fox and various native skinks.

It was noted that limited marginal foraging or dispersal habitat may be present for the Green and Golden Bell Frog, but the likelihood of this species being present at this site is low, despite the proximity to the key population. This species was historically recorded at the Marsh Street wetlands, which is adjacent to the site, however recent records are limited to the Kogarah Golf Course and the breeding ponds on the eastern side of the M5 East Motorway.

Figure 7-3 Vegetation communities within the site

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Assessment of potential impacts

The ponds form part of the management measures outlined in Chapter 30 of the EIS to support the long term survival of the local Green and Golden Bell Frog population by expanding and enhancing the habitats available for the species. The project would provide future habitat (including foraging, breeding and sheltering habitat) for the Green and Golden Bell Frog population, increasing the habitat available in the surrounding area. The provision of additional habitat was recommended in the EIS, with the Plan of Management for the species supporting the need for additional habitat. The project is considered to have an overall positive impact to the Green and Golden Bell Frog population.

The site is considered to have a low biodiversity value, and therefore the construction impacts of the project to existing biodiversity values of the site are considered to be negligible.

The removal of vegetation would be required to facilitate the installation of infrastructure associated with the project. This vegetation is not considered threatened, nor is it likely to provide habitat for native fauna species, as outlined above.

Environmental management measures

Construction and operation of the Marsh Street ponds would not introduce additional adverse ecological impacts to those presented in the EIS. Further, the Marsh Street ponds would result in a beneficial outcome for the local Green and Golden Bell Frog population as they would provide suitable habitat for the release of individuals from the captive breeding program. The construction and operation of the Marsh Street ponds would not have a significant negative impact on biodiversity values.

Any potential impacts associated with the construction of the ponds would be mitigated and managed through the implementation of the biodiversity environmental management measures for the project, as provided in **Chapter 8** (Revised environmental management measures). However, it is recommended that the following amendment (as shown as ~~strikethrough text~~) be made with respect to B17 to ensure the appropriate management of noxious weeds at the site (refer **Table 7-10**).

Table 7-10 Revised management measure for noxious weed management

Impact	No.	Environmental management measure	Timing
Spread of weeds	B17	Vegetation within ~~the road reserve adjacent to~~ areas to be cleared will be managed in accordance with *Guide 6 – Weed Management and Guide 10 – Aquatic Habitats and Riparian Zones* of Roads and Maritime's *Biodiversity Guidelines* (RTA, 2011) to reduce the introduction and spread of noxious weed species.	Construction

7.1.7 Other environmental issues

Air quality

Background air quality surrounding the site is predominately influenced by vehicle borne emissions resulting from traffic movements along Marsh Street and the M5 East Motorway. These are both major arterial roads that experience high traffic volumes and associated vehicle-borne emissions. The predominant source of existing odour surrounding the site is from vehicular exhausts along surrounding arterial roads.

The closest sensitive receivers to the site are residential properties located directly adjacent to the site and around 35 metres south on Eve Street and 30 metres west on West Botany Street, Arncliffe Fire Station located around 100 metres south and Eve Street wetland located around 180 metres south-east.

The ponds have the potential to result in the generation of airborne particulates including dust and emissions from the operation of plant and machinery, and construction vehicle movements during construction. Plant, equipment and machinery that would be required for the ponds and have the potential to generate airborne particulates include:

- Excavator
- Dump truck
- Generator
- Construction vehicles
- Stump grinder.

Construction of the ponds would include activities such as earthworks and associated vehicle movements, excavation and stockpiling. These activities may temporarily impact on surrounding air quality due to elevated airborne dust levels.

During construction, ground surface disturbance would be confined to the site. There is potential for dust and odour impacts to migrate offsite in the absence of environmental management measures. However, given the distance to nearby occupied residential properties and the implementation of management measures to mitigate dust, the potential for off-site impacts are considered to be low. There is potential to disturb contaminated soils during excavation. The impacts of encountering contaminated material have been considered below (under Soil and groundwater).

Stabilisation would also happen progressively to avoid dust impacts generated by wind erosion of exposed areas. While short term stockpiling would be required in designated areas on site, the majority of spoil would be removed from site following excavation.

Overall, potential impacts from construction activities on air quality are anticipated to be minor and would be managed via the implementation of environmental management measures outlined in **Chapter 8** (Revised environmental management measures) of this report, which would also be stipulated in the Construction Environmental Management Plan.

During operation, the ponds would result in a minor generation of airborne particulates from the operation of machinery (such as a generator) required for maintenance activities. No odour impacts are anticipated during operation. No additional environmental management measures are considered necessary to mitigate air quality impacts.

Visual impact and urban design

The area surrounding the site is characteristic of mixed land uses and visual amenity. To the east is the private recreational open space area of Kogarah Golf Course and to the south, west and north are low density residential areas and the arterial road network. The site is currently a grassed vacant parcel of land with no evident purpose. The Eve Street Cycleway runs along the north-eastern side of the M5 East Motorway adjacent to the Kogarah Golf Course, before passing under the motorway near Eve Street wetland and continuing south towards Banksia Grove.

Construction of the ponds would occur on land owned by Roads and Maritime. Views from the north and west would be screened by the existing noise wall along Marsh Street and West Botany Street, and views from the east would be screened by dense vegetation along the M5 East Motorway, which would avoid visual impacts to the general community. However, construction would result in visual amenity impacts to residents south of the site located along Eve Street. Construction features that may affect visual amenity include:

- The presence of construction vehicles, machinery, plant and site equipment
- Safety barriers / fencing, including hoarding
- Stockpiled materials
- The provision of amenities for workers.

Generally, visual impacts would only be present for the duration of the construction of the ponds, which is anticipated to last for around six months. After this, the site would be restored and all construction vehicles, plant and machinery would be removed from the site. The anticipated visual impact would therefore be minor and temporary and would be mitigated, where required and practical, through the use of hoardings or temporary screening. Good housekeeping practices would be employed on-site to further minimise visual impacts.

During the operational stage of the ponds, an open grassed aspect would still be visible from Eve Street. The ponds may not be readily identifiable as ponds, but the tops of the emergent rushes would be visible. A storage shed would also be located on the southern perimeter of the site and would be visible from adjoining residential properties. The storage shed would cover an area of around five metres by five metres and would look like a typical garden shed or similar form. Access to the shed would be via Eve Street and landscaping would be undertaken as part of the detailed design.

The ponds would result in a minor transformation of the site, however the landscape character of the area is not anticipated to change. Vegetation and landscaping would be included as part of the ponds, which would result in a beneficial visual impact to residential properties along Eve Street.

Once construction of the ponds has been completed, it is anticipated that the visual amenity of the area would be enhanced. Impacts from construction activities on the landscape character and visual amenity of the area are anticipated to be minor and would be managed via the implementation of environmental management measures outlined in **Chapter 8** (Revised environmental management measures) of this report. No additional environmental management measures are considered necessary.

Social and economic

The project is located in an urban residential area and zoned as low density residential and classified roads under the *Rockdale Local Environment Plan 2011* (Rockdale LEP 2011). The site is located on vacant land, is currently fenced off from public access and is considered to have low social value. Given the low density of residential properties surrounding the site, only a small number of people would be directly affected by the construction of the project. Given that the closest commercial area is located around 250 metres north-west of the site along the Princes Highway, no impacts to the commercial operation of local businesses are anticipated.

Noise, vibration, dust, visual impacts and access disruptions during construction may have potential temporary amenity impacts on nearby residents in the surrounding area, particularly along Eve Street. Some construction vehicles would also use Brennans Road.

The creation of a dedicated conservation area for the Green and Golden Bell Frog population is anticipated to have social relevance to the community.

The majority of the social and economic impacts of the ponds relate to impacts assessed in other sections of this assessment, including air quality, traffic and access, noise and vibration, and visual amenity. These impacts would be short-term and minimised as far as practical given the implementation of appropriate management measures outlined in **Chapter 8** (Revised environmental management measures) of this report, which would be incorporated into the Community Involvement Plan. A significant impact on the local community is not anticipated.

Soil and groundwater

Soils

The *1:100,000 Soil Landscapes of Sydney* map indicates that the site is situated in Gymea landscapes with associated Hawkesbury and Lambert soil landscapes (Chapman and Murphy, 1989). These soils generally consist of highly erodible sandstone soils which reflect the predominantly sandy substrate and are generally of low fertility. This is combined with the presence of some more restricted soils of higher clay content associated with mudstone and shale layers within the sedimentary sequence, which tend to be deeper and of slightly higher fertility, stability and water-holding capacity (OEH, 2015).

The ponds have the potential to impact on soils during construction, which would involve ground disturbance, excavation works and the stockpiling of soil, which would result in the exposure of the underlying soils. As a result of these activities, there is potential for disturbed soils to be eroded by stormwater runoff from the site into the surrounding terrestrial and aquatic environments, causing impacts such as sedimentation of waterways. Increased sedimentation in natural waterways can result in reduced water quality as well as smothering of vegetation and clogging of channels, impacting the natural flow paths of the waterway.

Excavated spoil, in excess of site requirements or spoil not suitable for re-use, would be temporarily stockpiled on site prior to removal. These stockpiles have the potential to result in erosion generated by wind and / or rain. While short term stockpiling would be required in designated areas on site, the majority of spoil would be removed from site following excavation. Spoil would be managed in accordance with the Spoil Management Plan for the broader New M5 project.

These impacts would be short-term and confined to the construction stage of the project and are considered minor following the implementation of appropriate management measures for the duration of the construction activities. The appropriate management measures would form part of the Erosion and Sedimentation Management Plan and be implemented on site via the Construction Environmental Management Plan. No additional environmental management measures are considered necessary.

Contamination

The site currently consists of cleared and mostly grassed land with the exception of some trees around boundaries. There appears to be no current activities on the site that would cause soil or groundwater contamination.

The 1930 and 1943 historical aerial photographs from the *Technical working paper: Contamination* (Appendix O of the EIS) showed that around half of the site consisted of low density residential houses and the remainder of the site was pastured paddocks with some bare patches of earth. Another house was located within the northern end of the site. Market gardens were adjacent on the land to the east of the site. The up-gradient land use consisted of Marsh Street followed by low to medium density residential houses and then an industrial area, 200 metres to the west, of about one hectare in size. The houses within the site appeared to be Californian brick bungalows and were likely constructed in the 1910s and 1920s.

The 1970 and 1982 historical aerial photographs showed that a bus depot was located on the northern third of the site in the location of the former paddocks and then another building that may have been either a house or commercial property.

The houses and bus depot were demolished by the then Roads and Traffic Authority for the M5 East Motorway construction in 1997. The construction of the M5 East Motorway was completed in December 2001. During construction, a noise barrier was installed along the western boundary of the site. During the construction of that project, the site was likely used for spoil stockpiling or as a construction compound.

According to the Botany Bay 1:25 000 Acid Sulfate Risk Map (SCS DLWC, 1997), the eastern side of the site is mapped as disturbed terrain. Based on the site elevation and the maps, it is unlikely that significant filling has occurred across the site, however there may be filling along the eastern boundary and some filling may have occurred to level the site for construction purposes.

Based on the above, potential on-site contamination sources include hazardous building materials, uncontrolled fill along the eastern boundary, historical lead fallout from vehicle emissions along the western and northern boundary and storage of spoil, fuels, oils and chemicals. Most of the contamination would be expected to be surficial with the exception of filled areas or areas where significant spills occurred. Potential contaminants of concern include heavy metals including lead, asbestos, pesticides and herbicides, polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPH) and BTEX (benzene, toluene, ethylbenzene and xylene).

Groundwater is anticipated to be encountered at depths less than two metres below the ground surface. The closest up-gradient potential source of groundwater contamination is the industrial land 200 metres to the west of the site. Due to the distance between the site and the potential source the likelihood of significant groundwater contamination migrating onto the site is considered to be low. Localised groundwater contamination may have occurred from fuel spills associated with the former bus depot.

Based on the historical use of part of the site as a bus depot, a targeted contamination investigation will be completed in the location of the former depot (Lot 7, 8 and 9 in DP1069479) and a search of Workcover dangerous goods would be undertaken prior to the investigation to locate potential former fuel storage areas. The investigation would be conducted in accordance with the requirements of the *Contaminated Land Management Act 1997* (CLM Act).

Potential contamination in all other areas of the site would be managed by implementing the unexpected finds procedure in the Construction Environmental Management Plan. As described in Chapter 17 (Contamination) of the EIS, in the event of encountering unexpected finds of contamination during construction (ie. the observation of offensive odours, soil discoloration, buried waste or potential asbestos containing materials), work in the area would cease until an appropriately qualified environmental consultant can advise on the need for further assessment, remediation or other action, as deemed appropriate. Further assessment and management of contamination, if required, would be undertaken in accordance with the CLM Act.

Excavated spoil would be managed in accordance with the construction environmental management plan, including procedures for handling and storing potentially contaminated spoil and undertaking waste assessment and classification for off-site disposal to appropriately licensed waste facilities, as described in Chapter 24 (Resource use and waste minimisation) of the EIS.

Acid Sulfate Soils

According to the Botany Bay 1:25 000 Acid Sulfate Risk Map (SCS DLWC, 1997), the site is mapped as having no known occurrence of acid sulfate soils and is within Class 5 mapped land. Class 5 lands require an Acid Sulfate Soil Management Plan (ASSMP) if the water table is likely to be lowered below one metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land. As the proposed works do not involve groundwater dewatering and there are no known occurrences of acid sulfate soils within the site, an ASSMP is not required.

Groundwater

Three ponds would be established, with the larger and deeper pond reaching a depth of around 1.5 metres below the ground surface. While the depth of excavation would be relatively shallow and unlikely to exceed a depth of two metres, groundwater is anticipated to be encountered at depths less than two metres below the ground surface. In the event that shallow groundwater is encountered during excavation works, the dewatering of excavations may be necessary. Given the minor extent of excavation, groundwater quantities are not expected to be significant if encountered.

Encountered groundwater would be captured and tested to determine whether it is of an acceptable water quality to be released back into the environment. Where the quality and volume allow, the water would be passed through a filtration structure, such as geofabric, and released onto adjacent land in a way that ensured it soaked into the ground rather than entered waterways. Where the volume and quality of water was not suitable for release, the water would be disposed of offsite at an appropriate facility.

The interception of groundwater would be managed via the implementation of environmental management measures outlined in **Chapter 8** (Revised environmental management measures) of this report. No additional environmental management measures are considered necessary.

Non-Aboriginal heritage

A desktop review of the following relevant heritage registers was undertaken to inform the potential for impacts on non-Aboriginal heritage:

- World Heritage List
- National Heritage List

- Commonwealth Heritage List
- Register of the National Estate
- NSW State Heritage Register
- NSW State Heritage Inventory
- Section 170 Heritage and Conservation Register
- Rockdale LEP 2011
- EPBC Protected Matters.

Table 7-11 provides a summary of heritage items identified in the proximity of the project.

Table 7-11 Non-Aboriginal heritage items identified proximate to the site

Register	Item	Proximity to the site	Significance
State Heritage Register	Western Outfall Main Sewer - Rockdale to Homebush (SWSOOS No 1)	140 metres east	State
Rockdale LEP 2011	'House' 73 West Botany Street (ID I56)	60 metres north	Local
	'House' 31 Kyle Street (ID I35)	80 metres north-west	Local
	'Former hospital for women' 112 West Botany Street (ID I57)	160 metres south	Local
	'Federation cottage' 9 Brennans Road (ID I3)	180 metres south-east	Local

Given the minor and temporary nature of the works, the historical disturbance of this area by past projects, and the distance of the five identified items of local and State heritage significance from the site, impacts to historic heritage items are not expected. Environmental management measures outlined in **Chapter 8** (Revised environmental management measures) of this report would be implemented in the event that that any non-Aboriginal relics are discovered or encountered during construction. No additional environmental management measures are considered necessary.

Aboriginal heritage

A desktop review of the Aboriginal Heritage Information Management System (AHIMS) Database, maintained by OEH was undertaken on 16 February 2016 (refer to **Appendix G** of this report). The search did not identify any registered Aboriginal sites or places within a 200 metre buffer distance of the site.

The site has been subjected to varying degrees of disturbance associated with general urban residential development and the establishment of the surrounding arterial road network, as discussed in earlier sections of this chapter. It is therefore considered unlikely to contain in-situ evidence of past Aboriginal activity.

It is anticipated that there is a low likelihood that Aboriginal objects would occur within the site during construction project. It is recommended that the proposed works proceed with caution, with the implementation of environmental management measures outlined in **Chapter 8** (Revised environmental management measures) of this report should any unexpected finds be encountered. No additional environmental management measures are considered necessary.

Resource use and waste minimisation

Activities associated with the construction of the Marsh Street ponds have the potential to generate waste materials. The nature and volume of waste generated during construction would be predominantly non-hazardous and relatively minor. However, there is potential for impacts on the local environment if waste is not managed appropriately.

The following waste sources are likely to be generated during construction of the project:

- Excavated material unsuitable and/or not required for backfilling and restoration
- Wastes generated at the construction site, including wastewater from portable toilets and wastewater produced during plant and machinery cleaning and maintenance
- Domestic refuse generated by onsite personnel and construction workers
- Construction and process waste, including surplus materials from the construction of the Marsh Street ponds, such as pipes, concrete, gravel, fencing, off-cut materials, metals and barricades
- Maintenance waste – waste generated from site plant and vehicle maintenance such as oil and fuel (to be transported off site on the same day).

Waste management practices would be managed in accordance with the *Waste Avoidance and Resource Recovery Act 2001* by adopting the resource management hierarchy principles (in order of priority) of avoidance, resource recovery and disposal.

Providing waste is managed appropriately in accordance with the management measures outlined in **Chapter 8** (Revised environmental management measures) of this report and the *Waste Classification Guidelines* (DECCW, 2009), construction and operational wastes are not anticipated to have a significant adverse impact on the local environment. No additional environmental management measures are considered necessary.

7.1.8 Summary and justification

The establishment of the Marsh Street ponds was a recommendation of the Green and Golden Bell Frog Plan of Management prepared for the project. The Marsh Street ponds form part of a broader package of mitigation and management measures to ensure the long term survival of the local Green and Golden Bell Frog population by expanding and enhancing the habitats available for the species.

An assessment of the construction and operation of the ponds has been undertaken and demonstrates that the majority of potential impacts would be associated with the construction of the ponds, would be minor and temporary. In the long term, the establishment and management of the Marsh Street ponds would have an overall beneficial impact on the community and environment.

With the implementation of management measures outlined in **Chapter 8** (Revised environmental management measures) of this report, impacts on surrounding receivers of the environment are not expected to be significant.

During detailed design, further consultation would be undertaken with Rockdale City Council regarding the conveyance of discharged water from the site to the Marsh Street wetland to ensure that discharges are appropriately managed.

7.2 Local road upgrades

7.2.1 Description of changes

In response to the exhibition of the EIS, and in response to submissions that raised concerns relating to pedestrian connectivity and safety, a number of changes have been made to the local road upgrades. Changes to the local upgrades affect:

- Euston Road / Sydney Park Road / Huntley Street intersection
- Albert Street and Campbell Road intersection
- Change to the shared path within Sydney Park
- New Campbell Road (extension) / Southend Distribution Centre intersection.

Changes to the local road upgrades in these locations are described further within this section.

Also in response to submissions concerning the design of Euston Road and impacts to Sydney Park, Roads and Maritime would also investigate the ability to further reduce the width of Euston Road during detailed design through one or both of the following:

- Reductions in the lane widths
- Minimising the extent of, or need for the central turning lane along Euston Road.

This investigation would consider the changes to network performance, road safety for all users (including pedestrians) and implications for access to properties along Euston Road. It would also consider the benefits resulting from a reduction in road width to pedestrian crossing distances and times, as well as opportunities for:

- Reduced impacts to Sydney Park, including loss of park space and mature trees
- Additional roadside landscape treatments
- Repositioning the shared path on the western side of Euston Road further away from the kerbside lane to improve user amenity.

An environmental management measure has been included in **Chapter 8** (Revised environmental management measure) of this report to reflect this commitment.

Euston Road / Sydney Park Road / Huntley Street intersection

As part of the project, the Euston Road / Sydney Park Road / Huntley Street intersection would be upgraded from a roundabout arrangement to a signalised intersection. The design, as proposed in the EIS, included a high angle left turn lane with a pedestrian island for eastbound traffic travelling on Sydney Park Road and wishing to travel northbound on Euston Road.

In response to submissions concerning pedestrian amenity and safety, the high angle left turn lane and pedestrian island have been removed. It would also improve pedestrian connectivity, crossing distances and crossing times as the movement would be completed in one phase when compared to two phase arrangement provided for originally in the EIS.

Further, the left turn lane for southbound traffic on Euston Road on approach to the Sydney Park Road / Huntley Street / Euston Road intersection has been shortened as this was not required for intersection performance and would rationalise road space at this location. This in turn would provide some pedestrian amenity improvements (when compared to the design as presented in the EIS) where additional distance to the road is provided.

The intersection as amended by the Preferred Infrastructure Report is shown in **Figure 7-4**.

Albert Street and Campbell Road intersection

The project, as described in the EIS, allows for the installation of temporary signals at this intersection to provide for construction access to the future M4-M5 Link construction site. Permanent signals would now be provided at this intersection.

This would maintain the at-grade pedestrian connectivity provided by the signalised intersection for pedestrians travelling to or from Sydney Park from nearby residential, commercial and industrial areas. It would also provide for enhanced connectivity to new public active transport links and open space in and around the St Peters interchange. The provision of permanent signals would also provide for:

- An alternative crossing at the Princes Highway / Campbell Street intersection
- An alternative for pedestrians to the Campbell Road pedestrian and cyclist bridge. This would assist in reducing the risk of jaywalking.

Minor amendments have also been made to M4-M5 Link construction site access point.

The intersection as amended by the Preferred Infrastructure Report is shown in **Figure 7-5**.

Pedestrian and cyclist facilities

In addition to the clarifications provided in **Chapter 6** of this report, minor changes have been made to the shared path within Sydney Park in response to general comments concerning pedestrian and cyclist connectivity. This has been amended to be a separated pedestrian and cycle path, as well as an amendment to the alignment in order to provide a more direct connection to the Campbell Road pedestrian and cyclist bridge from Campbell Street.

This would provide a continuous separated pedestrian and cycle path from Mascot town centre and the Bourke Road and Bourke Street cycleway all the way to Camdenville Park completing the east-west active transport corridor. The integration of the separated path with the Campbell Road bridge design and the separated path at Campbell Street would be refined further during detailed design.

The pedestrian and cycle path as amended by the Preferred Infrastructure Report is shown in **Figure 7-5**.

New Campbell Road (extension) / Southend Distribution Centre intersection

The project, as described in the EIS (Table 5-5), included the provision of a new T-intersection at the junction of the Campbell Road extension and the Southend Distribution Centre access road.

To increase crossing opportunities for pedestrians along Campbell Road, this intersection would now be signalised. Signalisation would also provide for safer crossing for pedestrians and cyclists using the dedicated east-west active transport route across the distribution centre access driveway. It would also continue to service the access and egress for the distribution centre.

The intersection as amended by the Preferred Infrastructure Report is shown in **Figure 7-6**.

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Figure 7-4 Euston Road / Sydney Park Road / Huntley Street intersection, as amended

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Figure 7-5 Albert Street / Campbell Road intersection, as amended, and Sydney Park shared path, as amended

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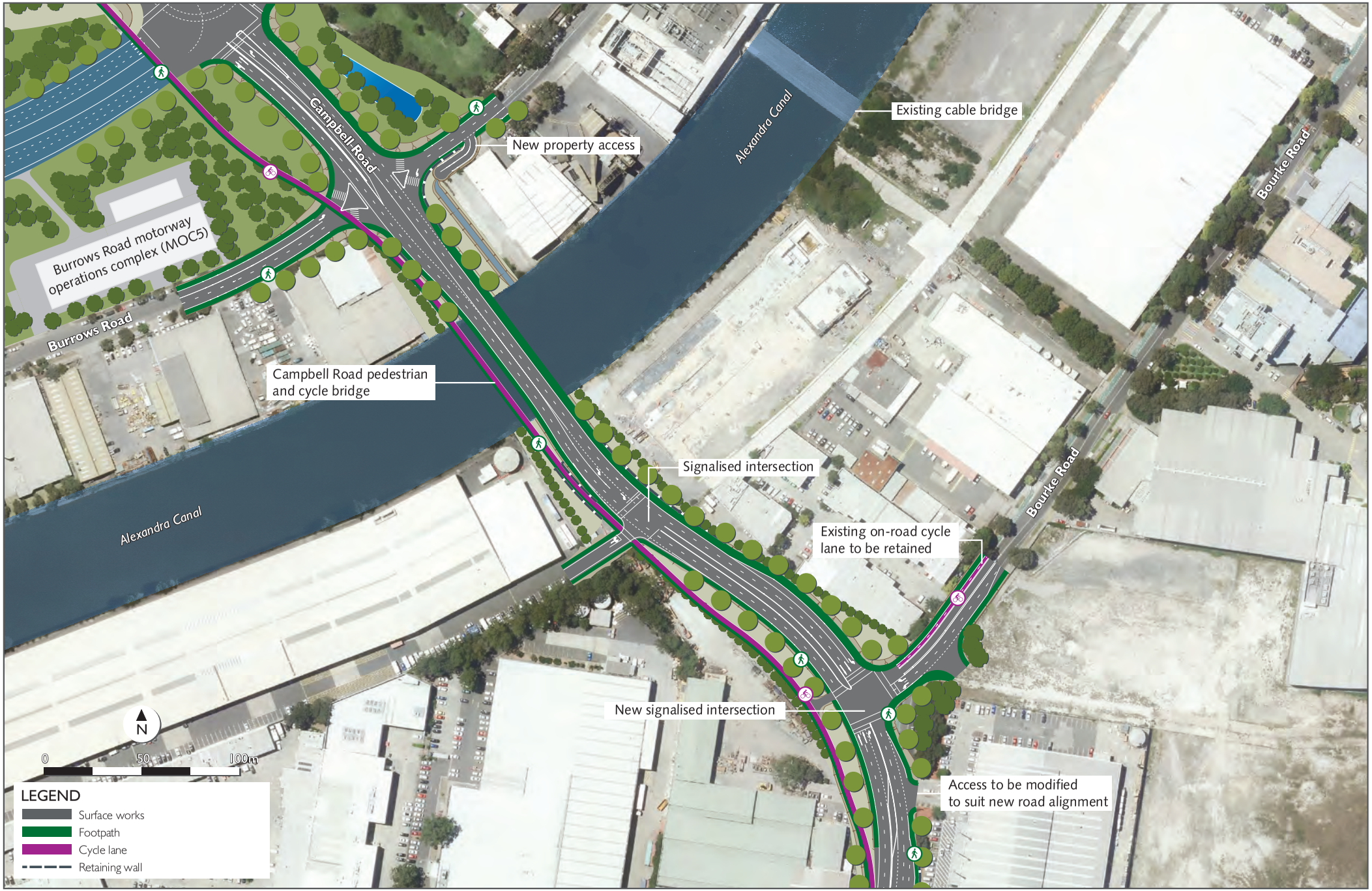

Figure 7-6 Campbell Road / Southend Distribution Centre intersection, as amended

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7.2.2 Environmental overview of changes

The potential impacts of the local road upgrade changes concerning the three intersections has been carried forward for further assessment.

The changes to the design of the path at Sydney Park would not generate any additional adverse impacts. The changes however, along with additional crossing opportunities, would enhance pedestrian connectivity and safety. The changes to the path at Sydney Park would also provide for a continuous separated pedestrian and cycle path from Mascot town centre and the Bourke Road and Bourke Street cycle ways all the way to Camdenville Park completing the east-west active transport corridor.

Traffic and transport

The changes to the three intersections would have an impact on the intersection and network performance of the road network as assessed in the EIS. To determine what impact, if any, these changes would have, the amended design was applied to the Paramics model that was developed for the New M5 EIS assessment (refer to Section 4.1.3.1 of the Technical working paper: Traffic and transport (Appendix G of the EIS)). The comparison was completed for:

- With project (2021)
- Full WestConnex program of works and the Southern Connector (2031).

The results are detailed below. In summary, the amended design would perform comparably to the design as assessed in the EIS. The comparison of the mid-block assessment suggests a small volume of vehicles would divert during the AM peak period in 2021 and 2031 as a result of changes at the Euston Road / Sydney Park Road / Huntley Street intersection. However, the volume of vehicles involved in this diversion would not have a significant impact on the safety, capacity or performance of the surrounding road network.

Network performance

A review of the network performance of the local road network as assessed in the EIS and as modified has been completed. This review found that the results for 2021 and 2031 between the two designs (presented in the EIS and as amended by this report) are comparable.

However, there is a slight increase in average speed predicted in the 2021 and 2031 PM peak a result of design amendments included in this report. This is due to the optimisation of the signal timings in order to include the permanent signals at Albert Street and Campbell Road, and to coordinate the signals along the Campbell Road / Street corridor between Euston Road and the Princes Highway to ensure intersection queuing does not block intersections. The increase in average speed is also reflected in the reduced number of stops in the model.

Table 7-12 St Peters model network performance – AM Peak (2021) comparison

Network measure	2021 'With project'	
	EIS design	As amended
All vehicles		
Total traffic demand (vehicles)	25,287	25,348
Total vehicle kilometres travelled in network (kilometres)	74,863	75,095
Total time travelled in network (hour)	3,383	3,448
Total number of stops	156,270	159,030
Average per vehicle		
Average vehicle kilometres travelled in network (kilometres)	3.0	3.0
Average time travelled in network (minutes)	8.0	8.2
Average number of stops	6.2	6.3
Average speed (kilometre per hour)	22.1	21.8
Unreleased vehicles		
Unreleased demand (vehicles)	711	792
Percentage of total traffic demand	2.8%	3.1%

Table 7-13 St Peters model network performance – PM Peak (2021) comparison

Network measure	2021 'With project'	
	EIS design	As amended
All vehicles		
Total traffic demand (vehicles)	26,317	26,411
Total vehicle kilometres travelled in network (kilometres)	76,724	76,687
Total time travelled in network (hour)	2,859	2,649
Total number of stops	129,477	119,057
Average per vehicle		
Average vehicle kilometres travelled in network (kilometres)	2.9	2.9
Average time travelled in network (minutes)	6.5	6.0
Average number of stops	4.9	4.5
Average speed (kilometre per hour)	26.8	29.0
Unreleased vehicles		
Unreleased demand (vehicles)	50	47
Percentage of total traffic demand	0.2%	0.2%

Table 7-14 St Peters model network performance – AM Peak (2031) comparison

Network measure	2031 'full WestConnex and Southern Connector'	
	EIS design	As amended
All vehicles		
Total traffic demand (vehicles)	34,519	34,608
Total vehicle kilometres travelled in network (kilometres)	117,328	117,390
Total time travelled in network (hour)	4,360	4,343
Total number of stops	175,143	174,700
Average per vehicle		
Average vehicle kilometres travelled in network (kilometres)	3.4	3.4
Average time travelled in network (minutes)	7.6	7.5
Average number of stops	5.1	5.0
Average speed (kilometre per hour)	26.9	27.0
Unreleased vehicles		
Unreleased demand (vehicles)	1,003	1,035
Percentage of total traffic demand	2.9%	3.0%

Table 7-15 St Peters model network performance – PM Peak (2031) comparison

Network measure	2031 'full WestConnex and Southern Connector'	
	EIS design	As amended
All vehicles		
Total traffic demand (vehicles)	36,722	36,653
Total vehicle kilometres travelled in network (kilometres)	125,122	124,704
Total time travelled in network (hour)	4,422	4,433
Total number of stops	173,528	177,292
Average per vehicle		
Average vehicle kilometres travelled in network (kilometres)	3.4	3.4
Average time travelled in network (minutes)	7.2	7.3
Average number of stops	4.7	4.8
Average speed (kilometre per hour)	28.3	28.1
Unreleased vehicles		
Unreleased demand (vehicles)	268	289
Percentage of total traffic demand	0.7%	0.8%

Intersection level of service

A comparison of the intersection performance of the EIS design and the design as amended is provided in **Table 7-16** and **Table 7-17**.

The changes to the project would result in the following changes to the intersection performance in 2021 relative to the performance presented in the EIS:

- Campbell Road / Euston Road intersection Level of Service (LoS) would reduce in the AM peak from a LoS C to LoS D due to a slight increase in average delay. This is due to the inclusion of the permanent signals at the Albert Street / Campbell Road intersection and the need to coordinate signals along the Campbell Road / Campbell Street corridor
- The LoS of the Euston Road / Sydney Park Road / Huntley Road intersection would reduce in the AM peak from LoS C to LoS D. This is attributed to a slight increase in delay as a result of the removal of the high angle left turn lane. A review of signal optimisation upon opening may enable the LoS, as assessed in the EIS, to be maintained
- The LoS would slightly improve at the Gardeners Road / Bourke Road intersection in the PM peak, changing from a LoS D to LoS C
- The LoS would slightly improve at the Sydney Park Road / Mitchell Road intersection in the AM peak, changing from a LoS D to LoS C
- The LoS would slightly decrease at the Campbell Road / Bourke Road intersection in the PM peak from a LoS B to LoS C
- The LoS would slightly improve at the Princes Highway / May Street intersection in the AM peak, changing from a LoS C to LoS B.

The changes to the local road upgrades would result in the following changes to the intersection performance in 2031 relative to the performance presented in the EIS:

- The LoS of the Princes Highway / Sydney Park Road intersection would decrease from a LoS C to LoS D in the PM peak period. A review of signal optimisation upon opening may enable the LoS, as assessed in the EIS, to be maintained
- The LoS would slightly increase in performance at the Campbell Road / Bourke Road intersection from a LoS B to LoS C
- The LoS of the Gardeners Road / Kent Road intersection would slightly decrease from LoS B to LoS C in the PM peak
- The LoS of the Sydney Park Road / Mitchell Road would slightly increase from LoS D to LoS C in the PM peak.

In summary, in the majority of cases, there have been minor increases or decreases in the average delay at the affected intersections. However, this has resulted in the LoS increasing or decreasing relative to the LoS threshold definitions. However, the results are considered comparable given the marginal improvements or reductions in average delay.

For example, the average delay of the Gardeners Road / Bourke Road intersection in 2021 AM peak, as assessed in the EIS, was 43 seconds, representing a LoS D. The lower bound criterion for LoS D is 42 seconds. The amendments to the design of this intersection would decrease the delay to 37 seconds, and improve the LoS.

Table 7-16 Comparison of the Level of Service assessment – 2021 (with project)

Intersection	Scenario	Level of service	
		EIS design	As amended
Princes Highway/ Sydney Park Road	AM peak	C	C
	PM peak	C	C
Princes Highway/ May Street	AM peak	C	B
	PM peak	A	A
Princes Highway/ Campbell Street	AM peak	E	E
	PM peak	E	E
Princes Highway/ Canal Road	AM peak	F	F
	PM peak	D	D
Princes Highway/ Railway Road	AM peak	F	F
	PM peak	D	D
Sydney Park Road/ Mitchell Road	AM peak	D	C
	PM peak	D	D
Euston Road/ Sydney Park Road/ Huntley Street	AM peak	C	D
	PM peak	C	C
Unwins Bridge Road/ Campbell Street	AM peak	C	C
	PM peak	D	D
Campbell Street/Albert Street	AM peak	-	A
	PM peak	-	B
Campbell Road/ Euston Road	AM peak	C	D
	PM peak	D	D
Campbell Road / distribution centre access road	AM peak	-	A
	PM peak	-	A
Campbell Road / Bourke Road	AM peak	C	C
	PM peak	B	C
Ricketty Street / Kent Road	AM peak	C	C
	PM peak	C	C
Gardeners Road / Kent Road	AM peak	C	C
	PM peak	B	B
Gardeners Road / Bourke Road	AM peak	D	D
	PM peak	D	C
Gardeners Road/ O'Riordan Street	AM peak	F	F
	PM peak	F	F

Table 7-17 Comparison of the Level of Service assessment – 2031 (full WestConnex program and works and Southern connector)

Intersection	Scenario	Level of service	
		EIS design	As amended
Princes Highway/ Sydney Park Road	AM peak	C	C
	PM peak	C	D
Princes Highway/ May Street	AM peak	A	A
	PM peak	A	A
Princes Highway/ Campbell Street	AM peak	F	F
	PM peak	E	E
Princes Highway/ Canal Road	AM peak	C	C
	PM peak	C	C
Princes Highway/ Railway Road	AM peak	F	F
	PM peak	F	F
Sydney Park Road/ Mitchell Road	AM peak	D	C
	PM peak	D	D
Euston Road/ Sydney Park Road/ Huntley Street	AM peak	C	C
	PM peak	C	C
Unwins Bridge Road/ Campbell Street	AM peak	D	D
	PM peak	D	D
Campbell Street/Albert Street	AM peak	-	B
	PM peak	-	C
Campbell Road/ Euston Road	AM peak	D	D
	PM peak	E	E
Campbell Road / distribution centre access road	AM peak	-	A
	PM peak	-	A
Campbell Road / Bourke Road	AM peak	D	D
	PM peak	E	D
Ricketty Street / Kent Road	AM peak	B	B
	PM peak	C	C
Gardeners Road / Kent Road	AM peak	C	C
	PM peak	C	B
Gardeners Road / Bourke Road	AM peak	D	D
	PM peak	F	E
Gardeners Road/ O'Riordan Street	AM peak	F	F
	PM peak	F	F

Mid-blocks

A comparison of the predicted vehicles per hour at the assessed mid-block locations was completed and is provided in **Table 7-18**, **Table 7-19**, **Table 7-20** and **Table 7-21**.

The comparison of mid-block traffic counts for the EIS design and as amended are comparable, with the fluctuation in the number of vehicles between 10 and 40 vehicles.

The exception to this is for the Euston Road midblock, north of Sydney Park Road in 2021 and 2031. The volume of vehicles at this location falls from 1,950 vehicles in the AM peak to 1,720 vehicles in 2021. In 2031, the magnitude of change in volume is reduced. A review of the Paramics model suggests that this is a result of vehicles re-routing to Euston Road via Maddox Street and Mitchell Road when vehicles start to queue at the Sydney Park Road / Euston Road / Huntley intersection. This is an effect of the removal of the high angled left turn lane.

Table 7-18 Comparison of mid-block vehicles per hour 2021 (with project) (AM peak)

Location	Direction	2021 'without project'	2021 'with project'	
			EIS design	As amended
		veh/hr	veh/hr	veh/hr
King Street, south of Alice Street	Northbound	880	800	790
	Southbound	560	620	630
Railway Road, west of Princes Highway	Eastbound	540	590	600
	Westbound	630	730	770
Princes Highway, south of Railway Road	Northbound	2,590	2,580	2,560
	Southbound	1,060	980	1,010
Euston Road, north of Sydney Park Road	Northbound	1,050	1,950	1,720
	Southbound	790	1,110	1,090
Edgeware Road, west of Edinburgh Road	Eastbound	720	780	800
	Westbound	770	910	910
Gardeners Road, west of O'Riordan Street	Eastbound	1,230	1,350	1,370
	Westbound	1,150	1,150	1,150

Table 7-19 Comparison of mid-block vehicles per hour 2021 (with project) (PM peak)

Location	Direction	2021 'without project'	2021 'with project'	
			EIS design	As amended
		veh/hr	veh/hr	veh/hr
King Street, south of Alice Street	Northbound	830	910	930
	Southbound	1,030	1,010	980
Railway Road, west of Princes Highway	Eastbound	640	910	920
	Westbound	1,150	1,490	1,510
Princes Highway, south of Railway Road	Northbound	1,710	1,760	1,780
	Southbound	2,390	2,360	2,400
Euston Road, north of Sydney Park Road	Northbound	820	1,280	1,250
	Southbound	1,340	1,940	1,940
Edgeware Road, west of Edinburgh Road	Eastbound	1,060	1,090	1,100
	Westbound	830	1,030	1,040
Gardeners Road, west of O'Riordan Street	Eastbound	1,410	1,570	1,560
	Westbound	1,060	1,270	1,230

Table 7-20 Comparison of mid-block vehicles per hour 2031(full WestConnex program and works and Southern connector) (AM peak)

Location	Direction	2031 'without project'	2031 'full WestConnex and Southern Connector'	
			EIS design	As amended
		veh/hr	veh/hr	veh/hr
King Street, south of Alice Street	Northbound	1,100	870	860
	Southbound	450	730	730
Railway Road, west of Princes Highway	Eastbound	490	650	650
	Westbound	630	990	1,000
Princes Highway, south of Railway Road	Northbound	2,550	2,180	2,180
	Southbound	1,150	550	600
Euston Road, north of Sydney Park Road	Northbound	990	2,120	1,990
	Southbound	970	1,580	1,520
Edgeware Road, west of Edinburgh Road	Eastbound	760	820	810
	Westbound	830	920	920
Gardeners Road, west of O'Riordan Street	Eastbound	1,280	1,790	1,840
	Westbound	1,150	1,410	1,410

Table 7-21 Comparison of mid-block vehicles per hour 2031 (Full WestConnex program work works and Southern connector) (PM peak)

Location	Direction	2031 'without project'	2031 'full WestConnex and Southern Connector'	
			EIS design	As amended
		veh/hr	veh/hr	veh/hr
King Street, south of Alice Street	Northbound	890	940	950
	Southbound	980	1,210	1,230
Railway Road, west of Princes Highway	Eastbound	700	680	680
	Westbound	1,280	1,910	1,890
Princes Highway, south of Railway Road	Northbound	1,660	720	750
	Southbound	2,310	2,110	2,140
Euston Road, north of Sydney Park Road	Northbound	780	1,530	1,530
	Southbound	1,500	2,160	2,160
Edgeware Road, west of Edinburgh Road	Eastbound	1,030	1,110	1,120
	Westbound	730	1,040	1,060
Gardeners Road, west of O'Riordan Street	Eastbound	1,560	1,650	1,610
	Westbound	1,140	1,660	1,620

Travel time

The amendments to the local road upgrades would not significantly change the travel time assessment presented in the EIS for 2021 and 2031. The results of the update travel time assessment taking into account amendments to the local road upgrades are presented in **Table 7-22**, **Table 7-23**, **Table 7-24** and **Table 7-25**.

In 2021, there is a slight increase in journey time in the AM peak from WestConnex to north of Euston Road. This is a result of the removal of the high angle left turn slip from Sydney Park Road to Euston Road, and the required adjustment to the signals to accommodate the design change. Nevertheless the travel time is predicted to be only 6:30 minutes compared to 21:30 minutes along the Princes Highway to north of Euston Road.

In 2031, there is an increase in the travel time from WestConnex to north of Euston Road in the AM peak. There is also an increase in travel time from Princes Highway south to north of Euston Road in the AM peak and PM peak as a result of the local road upgrade amendments. This is a result of vehicles travelling through the additional signalised intersection at the Arthur Street and Campbell Road intersection, with some vehicles being caught at the new signals. However, the results are still comparable for the same journey in the 'without project' 2031 scenario. Further, the travel time is still predicted to be quicker when compared to the travel time for vehicles travelling along the Princes Highway to north of Euston Road.

Table 7-22 Travel time assessment – 2021 (with project) (AM peak)

From	To	Average travel time (min) – AM peak 2021 'without project'	Average travel time (min) – AM peak 2021 'project only'	
			EIS design	As amended
Princes Highway south	North of Euston Road	22:00	21:30	21:30
WestConnex south	North of Euston Road	-	6:00	6:30
Princes Highway north (King Street)	Sydney Airport Domestic Terminal	14:00	14:00	14:00

Table 7-23 Travel time assessment – 2021 (with project) (PM peak)

From	To	Average travel time (min) – PM peak		
		2021 'without project	2021 'project only'	
			EIS design	As amended
Princes Highway south	North of Euston Road	14:00	9:00	9:00
WestConnex south	North of Euston Road	-	6:00	6:00
Princes Highway north (King Street)	Sydney Airport Domestic Terminal	17:30	14:30	14:00

Table 7-24 Travel time assessment – 2031 (Full WestConnex program of works and Southern Connector) (AM peak)

From	To	Average travel time (min) – AM peak		
		2031 'without project	2031 'full WestConnex and Southern Connector'	
			EIS design	As amended
Princes Highway S	North of Euston Road	25:30	24:30	26:00
WestConnex S	North of Euston Road	-	6:00	6:30
Princes Highway N (King Street)	Sydney Airport Domestic Terminal	44:30	15:00	15:30

Table 7-25 Travel time assessment –2031 (Full WestConnex program of works and Southern Connector) (PM peak)

From	To	Average travel time (min) – PM peak		
		2031 'without project	2031 'full WestConnex and Southern Connector'	
			EIS design	As amended
Princes Highway south	North of Euston Road	38:00	9:30	11:00
WestConnex south	North of Euston Road	-	6:30	6:30
Princes Highway north (King Street)	Sydney Airport Domestic Terminal	45:00	13:00	13:00

Other considerations

Air quality and traffic noise

As discussed earlier within this section, the change in local road upgrades would re-route to Euston Road via Maddox Street and Mitchell Road when vehicles start to queue at the Sydney Park Road / Euston Road / Huntley intersection. This is an effect of the removal of the high angled left turn lane. The majority of these vehicles consist of light vehicles.

Given the likely minor change in vehicles volumes, this would lead to a negligible change in noise and air quality impacts as assessed in the EIS.

7.2.3 Summary and justification

Minor amendments have been made to the local road upgrades in response to consultation and design refinements. While the amendments would result in some changes in impacts as assessed in the EIS, the changes in traffic, air and noise impacts would be minor.

During detailed design, further investigations would be undertaken to reduce the width of Euston Road with consideration of road safety, network performance, property access, open space and landscape impacts and pedestrian amenity.

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8 Revised summary of environmental management measures

The environmental impact statement (EIS) for the New M5 project identified the environmental management measures that would be adopted to avoid or reduce environmental impacts (Chapter 30 of the EIS). All measures identified would be incorporated into management plans.

After consideration of the issues raised in the public submissions, the environmental management measures for the project have been revised (**Table 8-1**).

The adjustments to the measures were made to:

- Make additional commitments based on the response to submissions within the report
- Make additional commitments based on the findings of further assessments provided within this report
- Modify the wording so that the outcome of the commitment is clearer to implement.

Where new commitments have been added or new text has been added to an existing measure, it is in **bold text**. Where a commitment has been deleted or text from the commitment deleted it appears as ~~strikethrough text~~.

Table 8-1 Revised summary of environmental management measures

Impact	No.	Environmental management measure	Timing
Traffic and transport			
Construction			
General	TT01	A Construction Traffic Management and Safety Plan (CTMSP) would be prepared as part of the CEMP. The CTMSP would 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 line marking and temporary barriers) • Traffic control devices such as traffic 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 compounds and the specific controls required at specific locations • Any specific provisions required to manage potential impacts to sensitive users, such as schools, child care centres and health facilities. • **Strategies to minimise impacts on on-street car parking due to construction workers**. The CTMSP would 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.	Pre-construction
Impacts to road network performance (delays) and safety	TT02	Construction methods and staging would be designed to minimise road closures, subject to other project constraints, and ensure that disruptions to existing traffic are minimised as much as feasible and reasonable.	Construction
	TT03	Construction works would be carried out offline, where possible. Where offline construction is not practical, and for tie-ins between online and offline sections of the project, construction sequencing and any temporary works identified would aim to minimise user delay while providing sufficient flexibility for the selected contractor to safely and efficiently construct the project	Construction
	TT04	Works that would significantly reduce the performance of the road network would be scheduled for periods of typically lower traffic volumes where feasible and reasonable.	Construction
	TT05	Work areas would be isolated from general traffic using temporary safety barriers where possible.	Construction

Impact	No.	Environmental management measure	Timing
	TT06	Temporary closed-circuit television (CCTV) and Variable Message Signs (VMS) would be provided at the outset of construction to link with the existing Transport Management Centre (TMC) network to facilitate monitoring and management of traffic impacts	Construction
	TT07	Traffic volume data would be analysed to identify capacity requirements, assess the potential impact of lane occupancies on traffic flows, plan lane occupancies to minimise the work area, and identify the best time to minimise inconvenience to road users. Restrictions and obstructions would be limited, road capacities maximised and peak traffic periods avoided where possible	Construction
	TT08	Impacts on pedestrian paths and cycle lanes would be minimised, and alternatives provided during construction where practical and safe to do so	Construction
	TT09	Impacts to bus stops would be identified and alternative locations and access would be provided. This would be undertaken in consultation with Transport for NSW and the relevant bus service provider	Construction
	TT10	Local road closures would be managed and adequate property access maintained. This would be undertaken in consultation with Roads and Maritime, local councils and property owners likely to be impacted	Construction
	TT11	A spoil management plan would be prepared with subsequent monitoring of heavy vehicle and haulage routes to ensure compliance and minimise impact on local roads off the arterial road network	Construction
	TT12	A road dilapidation report(s) would be prepared identifying existing conditions of local roads and mechanisms to repair damage to the road network caused by heavy vehicle movements associated with the project.	Construction
	TT13	Road occupancy licences would be obtained where required.	Construction
Impacts to emergency services	TT14	The CTSMP would be developed in consultation with local emergency services and procedures would be implemented to maintain priority access and a safe environment for emergency vehicles to travel through construction areas. The CTSMP would include measures to keep emergency services informed of the staging and progress of construction works.	Construction
Construction compound layout	**TT15**	**The location of the car park and site office associated with the Kingsgrove North construction compound (C1) would be further refined with alternatives considered during construction planning, including the opportunity for the use of the existing Garema Circuit carpark**	**Detailed design**
Operation			
Impacts to road safety	OpTT01	A road safety audit would be undertaken by a qualified auditor(s) as part of the detailed design, and again immediately prior to project opening, to examine the design from a road safety perspective and identify potential safety issues. This process would be undertaken in accordance with the Roads and Maritime Accident Reduction Guide Part 2: Road Safety Audits (RTA, 2005a).	Detailed design and prior to operation

Impact	No.	Environmental management measure	Timing
Impacts to road network performance	OpTT02	An operational traffic review would be conducted 12 months following the commencement of operation to confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections. The operational traffic review would be undertaken by a suitably qualified traffic specialist that is independent of the design and traffic studies undertaken as part of the environmental impact statement. The operational traffic review would include **(but is not limited to)** an assessment of the level of service at major intersections on local roads around the St Peters interchange, the King Georges Road interchange and changes in traffic levels on parallel arterial roads, such as Stoney Creek Road.	Operation
Design refinements (Euston Road)	**OpTT03**	**During detailed design, the ability to further reduce the width of Euston Road would be investigated through:** • **Further reductions in the lane widths and/or** • **Minimising the extent of, or need for, the central turning lane along Euston Road.** **This investigation would consider the changes to network performance, road safety for all users (including pedestrians), implications for access to properties along Euston Road, amenity improvements for pedestrians / cyclists, benefits to reduced impacts on Sydney Park and vegetation, and opportunities for additional landscaping.**	**Detailed design**
Air quality			
Construction			
General	AQ01	Develop and implement a Construction Air Quality Management Plan in consultation with the NSW EPA. Any measures that are required will differ depending on the activities occurring, and so will need to be tailored for each individual site.	Pre-construction
	AQ02	Carry out regular site inspections to monitor compliance with the Construction Air Quality Management Plan, record inspection results.	Construction
	AQ03	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	Pre-construction
	AQ04	Display the name and contact details of person(s) accountable for air quality and dust issues at the boundaries of each construction area. This may be the environment manager/engineer or the site manager. Display the head or regional office contact information.	Construction
Dust management	AQ05	Plan site layout so that machinery and dust causing activities are located away from receivers, as far as is possible.	Construction
	AQ06	Erect solid screens or barriers around dusty activities or the site boundary.	Construction
	AQ07	Ensure, where reasonable and feasible, that appropriate control methods are implemented to minimise dust emissions from the project site.	Construction
	AQ08	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site, cover as soon as practicable.	Construction

Impact	No.	Environmental management measure	Timing
	AQ09	Impose and signpost a maximum-speed-limit of 20 km/h on surfaced and unsurfaced haul roads and in work areas.	Construction
	AQ11	Where practicable, only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, (e.g. suitable local exhaust ventilation systems).	Construction
	AQ12	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	Construction
	AQ13	Where possible, use enclosed chutes and conveyors and covered skips.	Construction
	AQ14	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	Construction
	AQ15	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using appropriate cleaning methods.	Construction
	AQ16	Avoid scabbling (roughening of concrete surfaces) if possible.	Construction
Stockpile management	AQ17	Stockpiles would be located outside overland flowpaths, and where left exposed and undisturbed for longer than 28 days, would be finished and contoured to minimise loss of material in flood or rainfall events. Materials which require stockpiling for longer than 28 days would be stabilised by compaction, covering with anchored fabrics, or seeded with sterile grass where appropriate.	Construction
	AQ18	Where a stockpile, eg sand or fine aggregate, has the potential to generate dust, control measures would be implemented. These would include wetting the stockpile, covering the stockpile or contouring the stockpile.	Construction
	AQ19	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	Construction
	AQ20	For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	Construction
Tracking of material on roads	AQ21	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.	Construction
	AQ22	Avoid dry sweeping of large areas.	Construction
	AQ23	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	Construction
	AQ24	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	Construction
	AQ25	Record all inspections of haul routes and any subsequent action in a site log book.	Construction
	AQ26	Where reasonable and feasible, haul roads will be maintained with water carts and graders, and the condition of the roads will be monitored.	Construction

Impact	No.	Environmental management measure	Timing
	AQ27	Implement site exit controls (e.g. wheel washing system and rumble grids) to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable.	Construction
	AQ28	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	Construction
	AQ29	Access gates to be located at least 10 metres from receivers where possible.	Construction
Emissions management	AQ30	Ensure all construction vehicles comply with their relevant emission standards.	Construction
	AQ31	Ensure that, where practicable, engine idling is minimised when stationary.	Construction
	AQ32	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	Construction
	AQ33	Promote and encourage sustainable travel (public transport, cycling, walking, and car-sharing).	Construction
	AQ34	No bonfires and burning of waste materials.	Construction
Demolition	AQ35	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	Construction
	AQ36	Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground and may be more useful for covering larger areas.	Construction
	AQ37	Minimise explosive blasting where possible during demolition, using appropriate manual or mechanical alternatives.	Construction
	AQ38	Bag and remove any biological debris or other hazardous materials such as asbestos, damp down such material before demolition.	Construction
Earthworks	AQ39	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	Construction
	AQ40	Use hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	Construction
	AQ41	Where possible, only remove any cover for exposed areas in small areas during work and not all at once.	Construction
Cumulative impacts	AQ42	Regular communication with other high risk construction ancillary facilities within 500 metres of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.	Construction
	AQ43	Undertake regular on-site and off-site inspection, where receivers are nearby, to monitor dust, record inspection results.	Construction

Impact	No.	Environmental management measure	Timing
Complaints management	AQ44	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	Construction
	AQ45	Make complaints available to the Secretary upon request.	Construction
	AQ46	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	Construction
Operation			
Air Quality	N / A	Environmental management measures that are available for improving tunnel-related air quality are categorised as follows: • Tunnel design • Ventilation design and control • Air treatment systems • Emission controls and other measures • Monitoring. Refer to Section 10.10.2 **of the EIS** for detailed discussion of these categories.	Operation
Human health			
Construction			
Moving house as a result of property acquisition	HH1	Affected households would be provided **access to the following services to support them in the land acquisition process and relocation (including renters). These services include** access to a free counselling service; WestConnex Assist **and assistance from relocation support teams**. **Additional services which could include:** • **Assistance in identifying alternative properties** • **Independent social support for households relocating within the area and to other areas, providing contacts and information in regard to social services, facilities and logistical matters (eg logistics of moving including required administrative tasks)** • **Access to financial advice for affected households** • **First language support for households within English as a second language.**	Pre-construction

Impact	No.	Environmental management measure	Timing
Noise and vibration			
Construction			
General	NV1	A construction noise and vibration management plan(s) will be prepared and implemented consistent with the requirements of the *Interim Construction Noise Guideline* (DECC, 2009), and will include the following: • Identification of nearby residences and other sensitive land uses • Description of approved hours of work • Description and identification of construction activities, including work areas, equipment and duration • Description of what work practices (generic and specific) will be applied to minimise noise and vibration • A complaints handling process • Noise and vibration monitoring procedures • Overview of community consultation required for identified high impact works.	Pre-construction
Construction noise	NV2	Induction and training will be provided to relevant staff and subcontractors outlining their responsibilities with regard to noise.	Construction
	NV3	Noisy activities that cannot be undertaken during standard construction hours will be scheduled as early as possible during the evening and/or night time periods.	Construction
	NV4	Permanent noise barriers will be scheduled for completion as early as possible in order to minimise construction noise.	Construction
	NV5	Property treatments identified for the operational phase of the project will be considered for installation before or early in the construction period, where they would improve noise levels.	Construction
	NV6	Acoustic sheds will be erected at the Kingsgrove North (C1), Bexley Road North (C4) and Bexley Road South (C5) construction compounds, to mitigate noise generated by tunnelling support activities. The noise attenuation requirements for these acoustic sheds will be reviewed and confirmed during detailed design.	Pre-construction
	NV7	Temporary acoustic hoardings will be installed at the Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), **the Marsh Street ponds site**, Canal Road (C8) and Campbell Road (C9) construction compounds. The design and location of acoustic hoardings will be confirmed during detailed design.	Pre-construction
	NV8	When working adjacent to schools, particularly noisy activities will be scheduled outside normal school hours, where practicable.	Construction
	NV9	Where feasible and reasonable, equipment with directional noise emissions will be oriented away from sensitive receivers.	Construction
	NV10	Verification checks on the noise emissions of plant and machinery will be conducted.	Construction

Impact	No.	Environmental management measure	Timing
	NV11	Ongoing noise monitoring will be undertaken during construction at sensitive receivers during critical periods to identify and assist in managing high risk noise events.	Construction
	NV12	Reversing of equipment will be minimised to prevent nuisance caused by reversing alarms. Use of non-tonal reversing alarms ('quackers') will be implemented to further reduce the nuisance caused by reversing alarms.	Construction
	NV13	Loading and unloading will be carried out away from sensitive receivers, where practicable.	Construction
	NV14	Deliveries will be carried out during standard construction hours where feasible and reasonable.	Construction
	NV15	Additional noise mitigation measures during out of hours works will be determined on a case-by-case basis using individual receiver predictions, and may consist of offers of alternative accommodation, monitoring, individual briefings, letter box drops, project specific respite offers, phone calls and specific notifications.	Construction
	NV16	Respite periods (eg one hour respite for every three hours of continuous construction activity) will be scheduled for high noise impact works where appropriate.	Construction
Construction traffic noise	NV17	Truck drivers will be advised of designated vehicle routes, parking and queuing locations, acceptable delivery hours and other relevant practices (ie minimising the use of engine brakes, and no extended periods of engine idling).	Construction
	NV18	Deliveries and spoil removal will be planned to avoid queuing of trucks around construction compounds.	Construction
Construction vibration	NV19	Before the start of tunnelling or other vibration intensive works at each site, condition surveys will be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface works.	Construction
	NV20	The safe working distances will be complied with where feasible and reasonable. This will include the consideration of smaller equipment when working close to existing structures.	Construction
	NV21	If vibration intensive works are required within the safe working distances, vibration monitoring or attended vibration trials will be undertaken at the outset of these works to ensure that levels are within relevant criteria.	Construction
	NV22	Building condition surveys of potentially affected structures will be completed both before and after the works to identify existing damage and any damage due to the works.	Pre-construction and post construction
Ground borne noise	NV23	Vibration intensive construction works will be confined to the less sensitive daytime period (9.00 am to 12.00 pm and 2.00 pm to 5.00 pm) as far as reasonably practicable.	Construction
	NV24	A detailed ground-borne noise assessment will be undertaken following further geotechnical investigations. This will include developing the vibration site law for the project.	Construction
Blasting	NV25	Noise and vibration mitigation methods specific to blasting will be incorporated into the construction noise and vibration management plans where required.	Construction

Impact	No.	Environmental management measure	Timing
	NV26	Blasting with the potential to generate an impact at the surface will be restricted to standard daytime hours (except where approved by the relevant authority). Blasting would occur between 9:00am and 5:00pm, up to five days per week (Monday to Friday) and on Saturdays (9:00 am to 1:00pm). Blasts would be limited to one single detonation in any one day per receiver group, unless otherwise agreed by the NSW EPA through consultation on the Construction Noise and Vibration Management Plan.	Construction
	NV27	Site investigations will be conducted prior to production blasting to define suitable blast sizes to comply with project blasting noise and vibration criteria.	Construction
	NV28	Dilapidation studies of nearby receiver buildings will be undertaken where the potential for exceedances of the blasting criteria is identified.	Pre-construction
	NV29	Where the predicted levels exceed the noise or vibration criteria for blasting, alternative construction methods, such as penetrating cone fracture, will be utilised.	Construction
Consultation with impacted receivers	NV30	Community consultation protocols for sensitive receivers likely to be impacted by construction activities such as blasting, vibration and noise will be prepared and implemented.	Pre-construction and construction
Garema Circuit	**NV31**	**The implementation of a left in and right out arrangement for heavy vehicles at the Garema Circuit access point to Kingsgrove North construction compound (C1) would be considered during construction planning to restrict heavy vehicles to using only the eastern side of Garema Circuit.**	**Pre-construction and construction**
Operation			
Road traffic noise	OpNV01	At locations where residual impacts remain after all feasible and reasonable approaches have been exhausted, noise mitigation in the form of acoustic treatment of existing individual dwellings will be considered.	Operation
	OpNV02	Operational traffic noise will be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the predicted levels, consideration of additional feasible and reasonable mitigation measures will be undertaken.	Operation
Operational fixed facilities	OpNV03	Operational fixed facilities will be designed to meet project specific noise criteria derived in accordance with the *NSW Industrial Noise Policy*.	Pre-construction
Land use and property			
Construction			
Temporary acquisition	LP01	The relevant property owners would be consulted in relation to the acquisition of properties required to facilitate construction of the project. Acquisition would be undertaken consistently with the principles in the Land Acquisition Information Guide (Roads and Maritime, 2014b) and the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW).	Construction
Property access	LP02	Prior to any impact to access, alternative arrangements would be negotiated with the affected parties in order to enable continued access and to minimise disruption as much as reasonably possible.	Pre-construction and construction

Impact	No.	Environmental management measure	Timing
	LP03	Affected property owners and community facilities would be provided with advanced notification of relevant project schedules, construction works and changes to access arrangements.	Construction
	LP04	Community updates would be provided on changes to the local road network within the project area during construction.	Construction
	LP05	Appropriate signage would be provided advising of walking track closures and alternative walking routes.	Construction
Settlement	LP06	A Settlement Monitoring Plan would be prepared that would provide details on: • Location of monitoring points • Duration of monitoring • Data collection and review • Roles and responsibilities for review of data • Triggers and actions for corrective actions.	Construction
	LP07	Building condition surveys would be undertaken on properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres of surface.	Construction
	LP08	Services in locations where differential / angular settlement is anticipated would be identified. A monitoring plan, triggers and actions would be agreed with the utilities owner prior to potential impacts occurring.	Construction
	LP09	A monitoring program, undertaken as part of the Settlement Management Plan, would be undertaken to ensure that settlement has stabilised before monitoring is completed.	Construction
Property	**LP10**	**Sites directly affected by construction works, including demolition of structures, would consider the potential for, and where necessary treat, termites consistent with AS 4349.3 2010 Inspection of Buildings – Timber Pest Inspections and AS 3660.2 2000 Termite Management In and Around Existing Buildings and Structures.**	**Preconstruction/ construction**
Operation			
Permanent acquisition	OpLP01	Land acquisition for the project would be undertaken consistently with the principles in the Land Acquisition Information Guide (Roads and Maritime, 2014b) and the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW).	Detailed design / preconstruction
Loss of land use and property access	OpLP02	Property accesses that are affected as a result of the project would be reinstated in consultation with the affected landowners including relocation if required.	Detailed design / construction

Impact	No.	Environmental management measure	Timing
Visual impacts and urban design			
Construction			
Landscaping	V01	Existing vegetation around the perimeter of the construction compounds would be retained where feasible and reasonable, particularly: • Vegetation surrounding the Bexley Road East construction compound, particularly along the boundary between residential properties and the compound along the northern and eastern boundaries • Mature trees along the north-west (Marsh Street) and south-west boundaries of the Arncliffe construction compound site • Mature trees and vegetation along the boundary of Sydney Park along Campbell Road and Barwon Park Road.	Pre- construction
	V02	Landscape planting would use fast growing species where reasonable and feasible. This would soften views of construction sites, particularly for compounds located within public recreational spaces.	Construction
	V03	Revegetation and landscaping would be undertaken progressively.	Construction
Visual amenity	V04	Temporary noise barriers would be erected early within the site establishment phase where required to minimise noise impacts and provide visual screening.	Pre-construction / construction
	V05	Temporary noise barriers would be designed to include painted surface and project information / logo to deter graffiti and reduce the scale of noise barriers, particularly adjacent to residential areas or public open space.	Detailed design
	V06	Site hoardings and fencing would be regularly maintained, including the prompt removal of graffiti.	Construction
	V07	Acoustic sheds would be designed to minimise noise impacts and provide visual screening to be visually recessive, such as the use of mid toned colours and materials to minimise the intrusiveness and potential glare of the sheds.	Detailed design
Sydney Airport lighting	V08	During detailed design, the Roads and Maritime would liaise with the Civil Aviation Safety Authority to assess the potential for impacts of night lighting from the construction of the project on Sydney Airport operations. Mitigation measures would then be developed as required.	Detailed design
Lighting	V09	Cut-off or and directed lighting would be used within and outside of construction compounds with lighting location and direction considered to ensure glare and light spill are minimised.	Detailed design
	V10	The lighting design for shared paths located within the M5 Linear Park impacted by the project or located adjacent to compounds would be designed to minimise light spill to adjoining residential properties while maintaining a safe night time environment for path users (eg lighting position below the height of the fence line).	Detailed design
	V11	A signage strategy would be developed during detailed design for temporary wayfinding and safety. Potentially affected receivers would be consulted on the final signage in relation to the location and associated impacts.	Detailed design

Impact	No.	Environmental management measure	Timing
Signage	V12	Elements within construction sites would be located to minimise visual impacts as far as feasible and reasonable, for example, locating equipment back from site boundaries.	Detailed design / construction
Visual amenity	V13	Opportunities would be investigated to maximise the separation distances as far as reasonable and feasible: • Between the Kingsgrove North construction compound to the adjoining residential areas to reduce shading and visual impacts • Between the Bexley Road North and Bexley Road East construction compounds and adjoining residential areas to reduce sharing and visual impacts.	Detailed design
	V14	Opportunities would be investigated to provide an alternative southern cycle route for the length of the existing shared path impacted by the western surface works.	Detailed design
Operation			
Visual amenity	OpV01	Vegetated batters would be limited to 1:3 and 1:4 where possible in order to maximise the impact of vegetation on these batters and minimise maintenance.	Detailed design
	OpV02	Chain link fencing for sites would only be used where these would not be viewed by sensitive receivers, such as residents and users of recreational space. At these locations, high quality fencing suitable for parks and public spaces would be considered.	Detailed design
	OpV03	Where large areas of hardstand are or structures are designed, such as carparks, consideration of shade trees within these spaces would be considered where reasonable and feasible to soften views and provide shade and visual amenity.	Detailed design / post construction
	OpV04	Pedestrian and shared paths would be aligned away from residential property boundaries where public open space adjoins residential boundaries.	Detailed design
Landscaping	OpV05	Planting areas would be maximised, where feasible, between public open space and infrastructure, and would include taller screening vegetation (at the Bexley Road South motorway operations complex (MOC2) between the built form and the M5 Linear Park shared path for example).	Detailed design

Impact	No.	Environmental management measure	Timing
Landscape and urban design (general)	OpV06	A final urban design and landscape plan would be prepared in consultation with the New M5 Urban Design Review Panel, local councils within the project corridor and the local community. The Plan shall include (but not limited to): • The architectural treatment of the ventilation facilities, which would be informed by the functional requirements and the design principles detailed in the New M5 Urban Design Report. • Landscape plans and final plant species for the western surface works, Bexley Road motorway operations complex, Arncliffe motorway operations complex, the St Peters interchange and local road upgrades • The artwork strategy for the Kindilan underpass • **Outcomes of consultation with NSW Heritage Office with respect to integration of heritage interpretation into the urban design of the Alexandra Canal bridge crossings and St Peters interchange. The urban design of Alexandra Canal bridge crossings would also consider the Alexandra Canal Heritage Conservation Plan (NSW Architect's Office, 2004)** • Consideration of the outcomes of the Safety in Design review of the project.	Detailed design
Landscape and urban design at Kingsgrove	OpV07	The design of the noise attenuation at the western surface works would be confirmed during detailed design and in consultation with the local community. This may consist of noise mounds and barriers (or a combination of both) and with consideration to the provision of accessible open space at Beverly Grove Park and a landscaped outlook.	Detailed design
Landscape and urban design at Bexley	OpV08	Landscaping at the Bexley Road motorway operations complex would consider opportunities to complement the existing topography of the built site as well as the adjacent Wolli Creek bushland.	Detailed design
Landscape and urban design at Arncliffe	OpV09	Reasonable and feasible measures to use landscaping to screen or filter views of the Arncliffe motorway operations complex from residential areas to the west would be implemented.	Detailed design
Landscape and urban design at St Peters	OpV10	Opportunities to maximise the green canopy throughout the local road upgrades at Peters with tree planting in medians where safety barriers and / or speed limits permit would be explored during detailed design, and implemented where reasonable and feasible.	Detailed design
Sydney Airport lighting	OpV11	During detailed design, the Roads and Maritime would liaise with the Civil Aviation Safety Authority to assess the potential for impacts of night lighting from the operation of the project on Sydney Airport operations. Mitigation measures would then be developed as required.	Detailed design
Lighting	OpV12	Lighting design within motorway operations complexes, roadways, and on elevated pedestrian bridges would minimise the impacts of lighting to surrounding areas (particularly residential areas), for example through the use of cut-off, directed lighting and landscaping to minimise light spill and glare. This includes consideration of residences along Campbell Road.	Detailed design

Impact	No.	Environmental management measure	Timing
Campbell Road pedestrian and cycle bridge	**OpV13**	**Opportunities to further minimise the overshadowing and visual impacts to the 2-34 Campbell Road terraces by the Campbell Road pedestrian / cycle bridge would be explored during detailed design**	**Detailed design**
Social and economic			
Construction			
Accessibility	SEO1	A community involvement plan would be implemented to provide timely, regular and transparent information about changes to access and traffic conditions, details of future work programs and general construction progress throughout the construction phase of the project. Information would be provided in a variety of ways including letter box drops, media releases, internet site, signage and a hotline.	Construction
Property acquisition	SEO2	Acquisition would be undertaken consistently with the principles in the Land Acquisition Information Guide (Roads and Maritime, 2014b) and the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW).	Pre-construction and construction
Business impacts	SEO3	A toll free number and website would be maintained to enable business owners and/or operators to receive prompt responses to their concerns, access information and view assistance measures in place during construction related work.	Construction
	SEO4	A business impact risk register would be maintained to identify and manage the specific impacts associated with construction related works for individual businesses.	Construction
	SEO5	The business stakeholder forum would be continued during detailed design and throughout construction to address business concerns. Further information about consultation can be found in **Chapter 7** (Consultation)	Construction
Soils and water quality			
Construction			
Water quality	SW01	The control and mitigation of potential surface water quality impacts during construction would be defined in a Soil and Water Management Plan prepared as part of the overall CEMP.	Pre-construction/ construction
	SW02	The Soil and Water Management Plan would be developed to incorporate controls and measures in accordance with The Blue Book. The plan would be continually updated to suit the changing needs as the project works progress. The plan would be developed in consultation with the Environment Protection Authority and DPI - Water and document the types of measures that would be put in place to minimise the risk of soil erosion or polluted discharges reaching the receiving environments.	Pre-construction/ construction
	SW03	An Erosion and Sedimentation Management Plan would be prepared as outlined in the Erosion and Sedimentation Risk Assessment Procedure (RTA, 2008).	Pre-construction/ construction

Impact	No.	Environmental management measure	Timing
	SW04	The Soil and Water Management Plan would include: • Construction traffic restricted to delineated access tracks, and maintained until construction complete • Appropriate sediment and erosion controls to be implemented prior to soil disturbance • Stormwater management to avoid flow over exposed soils which may result in erosion and impacts to water quality • Stockpiles located outside the 20 year ARI flood extent where feasible. Otherwise, appropriate management control measures such as bunding would be implemented • Staging of surface works to minimise area of exposed surfaces, with re-vegetation and / or stabilisation of disturbed areas to occur as soon as feasible • Site compounds sealed or hard stand to minimise erosion where possible • Wheel wash or rumble grid systems installed at exit points to minimise dirt on roads • A soil conservation specialist would be contracted to supervise construction in high risk areas in accordance with the Erosion and Sedimentation Management Procedure (RTA, 2008c) • All water generated during construction would be captured, tested (and treated if required) prior to reuse or discharge under a site specific arrangement, depending on the quality of water generated. This would target compliance with the Water Quality Reference Criteria. At the St Peters interchange site this would include transfer of some water to the leachate treatment plant. Varying levels of groundwater quality would also require a variation to treatment approaches • Contaminated sediments and potential acid sulfate soils would be segregated and disposed of (with or without prior treatment as appropriate) at a licensed facility or treated onsite • Stockpiles would be located outside of riparian corridors.	Pre-construction/ construction
	SW05	The water quality and outflow velocities of the water treatment plants at the following compounds would be in accordance with the project's Water Quality Reference Criteria and the project's Environment Protection Licence: Kingsgrove North construction compound (C1), Commercial Road construction compound (C3), Bexley Road South construction compound (C5), Arncliffe construction compound (C7), Canal Road construction compound (C8).	Construction

Impact	No.	Environmental management measure	Timing
	SW06	The project specific water quality monitoring program would continue to collect to at least 12 months of data or to the commencement of construction (whichever is sooner) to represent pre-construction conditions for the project. Monitoring would continue during construction of the project as identified in Appendix A of the Technical working paper: Surface water (Appendix N). The details of this monitoring program would be contained in the Soil and Water Management Plan, and would include the following: • Sampling locations to include upstream (control) and downstream measurement locations • Samples taken twice a month, once in dry conditions and once in wet conditions where possible • In-situ monitoring of: – pH – Reduction Oxidation Potential – Dissolved Oxygen – Temperature – Conductivity – Turbidity – Colour – Odour • Analytical sampling of the following potential constituents of concern: – Total Recoverable Hydrocarbons – Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene – Nutrients including: Total Nitrogen, Total Kjeldahl Nitrogen, Nitrogen Oxide, Nitrite, Nitrate, Total Phosphorous and Reactive Phosphorous – Heavy metals (Arsenic, Cadmium, Copper, Chromium, Lead, Mercury, Nickel, Zinc) – Manganese – Ferrous Iron and Total Iron.	Pre-construction/ construction
	SW07	Water quality monitoring of the breeding ponds for Green and Golden Bell Frog near Marsh Street, Arncliffe would occur during construction by a suitably qualified scientist as part of the Green and Golden Bell Frog Plan of Management.	Construction
Water reuse	SW08	Opportunities for reuse of treated water generated at the Arncliffe motorway operations complex would be considered during detailed design.	Detailed design
Acid sulfate soils	SW09	An Acid Sulfate Soil Management Plan would be prepared as a sub-plan to the Construction Environment Management Plan to outline the requirements for the management of potential acid sulfate soils.	Pre-construction/ construction
	SW10	Further contamination investigation would be conducted in areas with medium or high acid sulfate soils potential during the detailed design stage as part of early works. Management of acid sulphate soils during the project would be undertaken as per the management measures outlined in Section 17.4 **of the EIS**.	Detailed design / pre-construction

Impact	No.	Environmental management measure	Timing
Contamination	SW11	During landfill closure activities, surface water management measures would be implemented in accordance with The Blue Book to isolate and capture potentially contaminated water. Any such water would be transferred to the leachate treatment plant for treatment prior to discharge to sewer under a trade waste agreement with Sydney Water.	Construction
Contaminated runoff and spills	SW12	The following measures would be in place to manage spills of contaminated fluids: • Areas would be allocated for the storage of fuels, chemicals and other hazardous materials • Facilities would be secured and bunded to levels dictated by Environment Protection Authority guidelines • Spills or contaminated runoff would be captured and treated and / or disposed of at a licensed facility • **With the exception of Arncliffe construction compound, Re-fuelling would occur in bunded areas or in areas beyond 40 metres from waterways. Where refuelling occurs outside bunded areas, specific refuelling procedures would be in place and operators would be trained in these procedures. Spill kits would be readily available to manage re-fuelling outside bunded areas. At Arncliffe construction compound, a bunded area would be provided where all refuelling would occur.** • ~~Re-fuelling, wash~~ **Wash** down and preparation of construction materials would be undertaken in bunded areas to mitigate risks in relation to spills or leaks of fuels / oils or other hazardous onsite construction material • The application of good practice in the storage and handling of dangerous and hazardous goods would provide appropriate practical responses to manage impacts on occupational health and safety and minimise the risk of a spill occurring • Potential discharges from construction sites would be managed through the installation of basins (primarily designed for sediment capture but with capacity to contain the nominated spill volume) constructed in accordance with The Blue Book • Captured contaminants resulting from spills or leaks would be treated and disposed of at a licensed facility • Any soil which has been contaminated with fuel, oils or other chemicals would be disposed as contaminated soil by a waste subcontractor.	Construction
Geomorphology	SW13	Construction work activities within and / or adjacent to waterways would be minimised as much as feasibly possible to minimise disturbance to those waterways and waterfront land.	Construction
	SW14	Alignment of drainage and discharge outlet infrastructure would direct flows downstream to minimise alterations and erosion of the channel beds and banks.	Detailed design/ construction
	SW15	Drainage and discharge outlet infrastructure would include energy dissipation and erosion scour protection as appropriate.	Detailed design/ construction

Impact	No.	Environmental management measure	Timing
	SW16	Disturbed floodplain environments adjacent to watercourses (including waterfront land) and / or along overland drainage lines would be stabilised and vegetation managed in accordance with the *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2012a).	Construction
Operation			
Surface runoff Surface runoff	OpSW01	Suitable stormwater treatment devices would be identified during detailed design, including an operational water treatment plant, with the aim of meeting the targets of the Botany Bay and Catchment Water Quality Improvement Plan (SMCMA, 2011). Where space is available, water quality basins would be installed. In the case where space is unavailable, treatment would include the use of proprietary stormwater treatment devices. The design of treatment trains would be informed by an assessment of the sensitivity of the receiving environments and supported by MUSIC modelling.	Detailed design/ operation
	OpSW02	The treatment capacity lost in decommissioning pond **WQP – 2** ~~WQP – 3~~ would be provided by new or upgraded stormwater treatment devices. **Replacement water quality devices would be installed and operational prior to decommissioning of the existing water quality pond (WQP-2) in Wolli Creek catchment.**	Detailed design/ operation

Impact	No.	Environmental management measure	Timing
Water quality monitoring	OpSW03	Operational water quality monitoring would be conducted for 12 months post-construction or as otherwise required by the conditions of approval. This would include upstream (control) and downstream monitoring locations. The details of this monitoring program would be contained in the Soil and Water Management Plan, and would include the following: • Sampling locations to include upstream (control) and downstream measurement locations • Samples taken twice a month, once in dry conditions and once in wet conditions where possible • In-situ monitoring of: – pH – Reduction Oxidation Potential – Dissolved Oxygen – Temperature – Conductivity – Turbidity – Colour – Odour • Analytical sampling of the following potential constituents of concern: – Total Recoverable Hydrocarbons – Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene – Nutrients including: Total Nitrogen, Total Kjeldahl Nitrogen, Nitrogen Oxide, Nitrite, Nitrate, Total Phosphorous and Reactive Phosphorous – Heavy metals (Arsenic, Cadmium, Copper, Chromium, Lead, Mercury, Nickel, Zinc) – Manganese – Ferrous Iron and Total Iron.	Operation
New discharge outlets	OpSW04	New discharge outlets into Alexandra Canal would be designed with sufficient energy dissipation or scour protection to limit the impact on contaminated sediments and reduce the possibilities of contaminated sediments being subject to scour or resuspension.	Detailed design/ operation
Existing drainage outlets	OpSW05	Where existing drainage lines are to be subject to increased inflow, an assessment of their discharge characteristics would be made. If necessary, energy dissipation or scour protection would be added to prevent contaminated sediments from being subject to scour or resuspended. This would be undertaken during detailed design.	Detailed design/ operation
Mitigation for spills	OpSW06	The assessment of risk of spills on the motorway would be undertaken during detailed design. If warranted, spill containment would be provided.	Detailed design/ operation
Operational water treatment plant	OpSW07	The operational water treatment plant would be designed to meet the Water Quality Reference Criteria outlined in Appendix A of the Technical working paper: Surface water (Appendix N). Monitoring of the Cooks River would be undertaken during initial operation of the project to ensure discharge meets these criteria.	Detailed design/ operation

Impact	No.	Environmental management measure	Timing
Geomorphology Geomorphology	OpSW08	Suitably designed scour and erosion control measures would be included in the detailed design.	Detailed design/ operation
	OpSW09	Drainage and discharge infrastructure where space is available would incorporate measures, as appropriate, to trap and remove sediments in line with the outcomes of the stormwater pollution reduction targets from the Botany Bay and Catchment Water Quality Improvement Plan (SMCMA, 2011). This would reduce the risk of any impacts to the geomorphic condition of receiving waters.	Detailed design/ operation
Contamination			
Construction			
Landfill closure	CM01	The closure and ongoing management of the Alexandria Landfill would be undertaken in line with the LCMP (see Section 17.3.4 and Section 5.9.1 **of the EIS**) and remedial action plan. This includes a landfill closure, environmental management and monitoring framework.	Pre-construction and construction
Landfill closure	CM02	A site specific management plan would be prepared for the Alexandria Landfill to manage the excavation of parts of the landfill during construction. The management plans, amongst other requirements would detail mitigation measures to: • Contain and treat landfill gas emissions from excavations • Treat offensive odours produced by leachate and landfill gas • Contain, extract and treat leachate within excavations • Protect workers and off-site receptors from exposure to potential biological, chemical and physical hazards encountered during the exhumation of landfill waste. • Manage asbestos contaminated wastes	Pre-construction
Disturbance and mobilisation of contaminated material	CM03	Potentially contaminated areas directly affected by the project would be investigated and managed in accordance with the requirements of guidance endorsed under section 105 of the CLM Act. This includes further investigations in areas of potential contamination identified in the construction footprint.	Pre-construction
General	CM04	An unexpected finds and hazardous materials procedure would be implemented to manage any potentially contaminated materials that may be encountered during site preparation and / or construction works.	Pre-construction
General	CM05	Waste management plans, as part of the CEMP, would include procedures for handling and storing potentially contaminated spoil and**, should off-site disposal be required,** undertaking waste assessment and classification for off-site disposal to appropriately licenced waste facilities. See Chapter 24 (Resource use and waste minimisation) **of the EIS** for more information.	Pre-construction
Asbestos	CM06	Site specific asbestos management plans would be developed where relevant. Refer to Chapter 24 (Resource use and waste minimisation) **of the EIS** for further information on asbestos management.	Pre-construction

Impact	No.	Environmental management measure	Timing
Hazardous materials	CM07	A hazardous materials assessment would be carried out prior to and during the demolition of buildings. Demolition works would be undertaken in accordance with the relevant Australian Standards and relevant NSW WorkCover Codes of Practice, including the *Work Health and Safety Regulation 2011.*	Pre-construction, construction
Dangerous goods	CM08	A dangerous goods search of the WorkCover NSW records for licenced dangerous good would be undertaken prior to construction.	Pre-construction
Explosive ordnance	CM09	An explosive ordnance due diligence assessment would be completed at the identified former ammunition site (Project area 3), located between Flatrock Road, Bexley Road and Wolli Creek.	Pre-construction
General	CM10	In the event of encountering unexpected finds of contamination (i.e. the observation of offensive odours, soil discoloration, buried waste or potential asbestos containing materials) during construction, work in the area would cease until an appropriately qualified environmental consultant can advise on the need for further assessment, remediation or other action, as deemed appropriate. Further assessment and management of contamination, if required, would be undertaken in accordance with section 105 of the CLM Act.	Construction
Contamination	CM11	Appropriate mitigation measures to minimise sediment mobilisation as a result of construction activities at the location of the new stormwater infrastructure at Alexandra Canal would be detailed in the CEMP in accordance with the requirements of the Remediation Order in consultation with NSW EPA and Sydney Water. **Measures would be detailed in a Alexandra Canal Contamination Management Plan.**	Pre-construction and construction
Contamination	CM12	Appropriate mitigation measures including stockpiling and management of potentially contaminated material would be undertaken at construction compounds to prevent movement of material into receiving waters.	Construction
General	CM13	Plant, equipment and supplies would be managed to prevent spills and leaks. See Chapter 26 (Hazard and risk) **of the EIS** for more information.	Construction
General	CM14	Tunnel washing water and waste would be appropriately contained, treated and disposed of. Refer to Chapter 24 (Resource use and waste minimisation) **of the EIS** for more information.	Construction
Contamination	CM15	Further *in situ* testing of soils in areas of known potential contamination to determine waste classification.	Construction
Operation			
General	OpCM1	The ongoing management of the Alexandria Landfill will be undertaken in line with the LCMP (see Section 17.3.4 and Section 5.9.1 **of the EIS**)	Pre-construction, construction and post construction
Contamination	OpCM2	Procedures to address spills, leaks and tunnel washing would be developed and implemented during operation of the project	Operation

Impact	No.	Environmental management measure	Timing
Scour protection	OpCM3	Measures to minimise sediment mobilisation during operation would be incorporated into the design of stormwater outlets at the location of the new stormwater infrastructure at Alexandra Canal. The design of the outlets, including discharge velocities and scour protection measures, would be confirmed during detailed design and supported by appropriate drainage modelling. The detailed design of the outlets **would be finalised in consultation with the NSW EPA with consideration of the requirements of the Remediation Order and** would be provided to Sydney Water **for approval (as the asset owner).** ~~and NSW EPA for approval in accordance with the requirements of the Remediation Order.~~	Detailed design
Contamination	**OpCM4**	**Ongoing management of sites with contamination managed or emplaced in-situ would be managed in accordance with site specific Site Management Plans. Where required, a Site Management Plan (SMP) would be developed and implemented to manage risks associated with the presence of residual contamination that in situ. The requirement for an SMP would be evaluated based on the nature, concentration and extent of contamination as well as the current and proposed land use.**	**Pre-operation**
Flooding and drainage			
Construction			
Flood Management Strategy	FD01	A Flood Management Strategy would be prepared by a suitable qualified and experienced person in consultation with directly affected landowners, DPI-Water, OEH, **Sydney Water** and the relevant local councils. It would include but not be limited to: • Identification of flood risks to the project and adjoining areas, including consideration of local drainage catchment assessments and climate change implications on rainfall, drainage and tidal characteristics • Design and mitigation measures to protect proposed operations and not worsen existing flooding characteristics during construction and operation, including soil erosion and scouring • Drainage system upgrades • Preparation of a flood / emergency management plan.	Pre-construction
Flood Management Strategy	FD02	The Flood Management Strategy would be peer reviewed and confirmed as meeting the requirements of this management measure by a suitably qualified and experienced independent hydrological engineer. It would be submitted to the Secretary of DP&E and the relevant local councils prior to construction works commencing in the vicinity of flood prone land and overland flow paths for the waterways and catchments in the vicinity of the project area, or as otherwise agreed by the Secretary of DP&E.	Pre-construction
Flooding design	FD03	The 100 year ARI flood level is to be adopted in the assessment of measures which are required to mitigate any adverse impacts attributable to the project. Changes in flood behaviour under PMF conditions would also be assessed in order to identify impacts on critical infrastructure and significant changes in flood hazards as a result of the project.	Detailed design

Impact	No.	Environmental management measure	Timing
Hydraulic assessment	FD04	A detailed hydraulic assessment into the impacts the project would have on flooding behaviour and relevant mitigation measures would be undertaken.	Detailed design
Flooding design	FD05	Works within the floodplain would be designed to minimise adverse impacts on surrounding developments for flooding up to the 100 year ARI flood. Assessment would also be undertaken of the impacts during flooding in excess of the 100 year ARI flood up to the PMF in the context of impacts to critical infrastructure and flood hazards.	Detailed design
Survey	FD06	A floor level survey would be undertaken in affected areas to determine whether the project would increase floor damages in adjacent developments (ie in properties where there is a potential for increases in peak flood levels for events up to the 100 year ARI flood).	Detailed design
Flood management	FD07	Flood management plans would be developed as part of the CEMP prior to construction to guide the detailed design of temporary ancillary facilities, including construction compounds, to minimise the potential impacts of flooding on the project.	Pre-construction
Flooding in existing residential development	FD08	Around 8,000 cubic metres of the projected 12,000 cubic metres of lost floodplain storage due to the operation of the Arncliffe motorway operations complex (MOC3) would be required to be recaptured. Floor level surveys would be undertaken to determine whether the project would result in the above-floor inundation of the following potentially affected properties. Further design development would be undertaken during detailed design to confirm the extent of works required to mitigate the impact of the project on flooding conditions at these existing residential developments.	Detailed design / construction
Flooding in existing commercial / industrial development	FD09	Detailed design would aim to reduce the impact of the project on flooding conditions for the following two potentially affected properties. This would include consideration of whether the project would result in above-floor inundation of these properties.	Detailed design / construction
Flooding in existing commercial / industrial development	FD10	The potential to reduce impacts of the project on flooding for the properties located on the western overbank of the Alexandra Canal would be considered during detailed design. This would also include consideration of whether the project would result in above-floor inundation of these properties.	Detailed design / construction
Flooding in TransGrid's Beaconsfield West substation	FD11	Further design development would be undertaken to mitigate the impact of the project on flooding conditions in the TransGrid site. This would include further refinement of design of the relief drain, as well as the western approach to the Campbell Road bridge.	Detailed design / construction

Impact	No.	Environmental management measure	Timing
Hydrology and flooding	FD12	Existing transverse drainage structures would be left in place during construction where transverse drainage structures are to be upgraded or replaced. If this is not feasible, temporary drainage would be adopted.	Detailed design / pre-construction
Hydrology and flooding	FD13	Detailed flood modelling to understand the effects of likely rainfall events would be undertaken. Construction layouts would be finalised accordingly.	Pre-construction
Hydrology and flooding	FD14	Tunnel dive shafts would be protected against flooding either through locating openings outside of flood prone areas or constructing temporary bunding and / or appropriate temporary drainage. Stockpiles would be located outside the 20 year ARI flood extent where possible. Where construction compounds are located in the 20 year ARI flood extent, a contingency plan to manage flooding would be prepared and implemented.	Detailed design / pre-construction
Hydrology and flooding	FD15	Further detailed assessment of flooding impacts for proposed construction compounds and relevant management measures would be undertaken during detailed design. Contingency plans to manage flooding would be prepared and implemented for high risk temporary facilities proposed including fuel storages, water treatment plants and substations, as well as for the following construction compounds (located either wholly or partially within the 20 year ARI flood extent): • Kingsgrove South construction compound (C2) • Commercial Road construction compound (C3) • Bexley Road North construction compound (C4) • Bexley Road South construction compound (C5) • Arncliffe construction compound (C7) • Alexandra Canal bridge construction compound (C12) • Gardeners Road bridge construction compound (C13). For these sites, suitable procedures for flood warning, emergency management, site evacuation and planning would be developed.	Detailed design / pre-construction
Hydrology and flooding	FD16	The following measures would be implemented to manage flooding risks on construction sites: • Temporary bunding around parts of the site that would be adversely affected by floodwaters • Temporary drains / detention areas within the site • Use of carparks to provide detention • Elevation of site buildings where necessary to get floor levels above expected flood levels • Use of erosion and sediment fences around noise barriers to provide bunding to some parts of the sites while directing overland flows through less sensitive parts of sites, particularly at Kingsgrove and Arncliffe.	Detailed design / pre-construction

Impact	No.	Environmental management measure	Timing
Hydrology and flooding	FD17	A drainage strategy would be determined during detailed design to manage the increased runoff within the catchment draining into Camdenville Park. This drainage strategy would be based on not increasing flows into the Eastern Channel for all events up to and including the 100 year ARI flood. **The strategy would be prepared in consultation with Marrickville Council.**	Detailed design / construction
Potential impacts of future climate change on flooding	FD18	A more detailed assessment would be undertaken during detailed design to determine the climate change related flood risks to the project and to scope requirements for any management measures. The assessment would be undertaken in accordance with the *Practical Considerations of Climate Change – Floodplain Risk Management Guideline* (DECC, 2007)	Detailed design
Operation			
Bridges	OpFD01	Bridge crossings over the Alexandra canal would incorporate a suitable freeboard between the underside of the bridge structure and the peak 100 year ARI flood level.	Detailed design / operation
Flooding design	OpFD02	The project and associated arrangements would be designed to limit increases in peak discharges into the downstream drainage systems in accordance with local council requirements.	Detailed design
Drainage and localised flooding	OpFD03	The control and mitigation of potential localised flooding and drainage impacts during operation would include: • Drainage systems that are of insufficient capacity would be modified or upgraded to cater for increased flows • Where new drains connect with existing drainage networks a survey and condition assessment would be undertaken to inform detailed design • The efficiency of transverse drainage upgrades would be taken into account during detailed design • The effects a partial blockage of major hydraulic structures on flooding behaviour would be considered when determining finished road level and flood wall heights.	Detailed design / operation
Tunnel portals and ancillary facilities	OpFD04	Tunnel entries and associated flood protection barriers would be located above the PMF level or the 100 year ARI flood level plus 0.5 metres (whichever is greater). The same hydrological standard would be applied to tunnel ancillary facilities such as tunnel ventilation and water treatment plants where the ingress of floodwaters would also have the potential to flood the tunnels.	Detailed design / operations
Tunnel design	OpFD05	A suitable freeboard would be incorporated into the design of openings into the new road tunnels (eg at the location of the tunnel portals and ventilation shafts). These designs would take into account the impacts of a partial blockage of major hydraulic structures as well as climate change induced sea level rise on PMF event levels.	Detailed design / operation
Emergency response facilities	OpFD06	Emergency response facilities, including the motorway control centre, tunnel fire water tank and pump buildings and associated electrical substations would be locate above the PMF level or the 100 year ARI flood level plus 0.5 metres (whichever is greater).	Detailed design / operations

Impact	No.	Environmental management measure	Timing
Groundwater			
Construction			
Disturbance of acid sulfate soils during excavation	GW01	An Acid Sulfate Soil Management Plan (ASSMP) would be prepared including the measures and monitoring to be undertaken where potential acid sulfate soils are expected. The plan would outline the type of treatment required for acid sulfate soils, bunding and requirement for treatment ponds.	Pre-Construction
Intersection of saline soils and groundwater	GW02	A groundwater and soil salinity report would be prepared prior to the commencement of earthworks to assess the potential impacts to the local hydrogeological regime.	Pre-Construction
Failure of the leachate pumping system	GW03	Contingency measures to address leachate management at the Alexandria Landfill during construction and prior to the commissioning of the new leachate treatment plant would be explored during detailed design. Identified measures would be detailed in the CEMP and implemented during construction.	Construction
Migration of contaminated groundwater into the tunnels.	GW04	The tunnel construction program would be constructed in accordance with an overarching CEMP for the project which would include measures to manage contaminated groundwater issues. This may include removal of the source of the contamination by excavation and remediation of shallow impacted soils or engineering a solution to prevent the migration of contaminated groundwater into the tunnels.	Construction
Intersection of shallow perched groundwater within Alexandria Landfill or Botany Sands	GW05	Intersected shallow contaminated groundwater would be directed to the construction water treatment plant prior to discharge. Elsewhere, collection and treatment options would be considered and releases made under relevant discharge criteria.	Construction
Intersection of shallow contaminated groundwater during construction activities at Arncliffe	GW06	The intersection of shallow groundwater at the Arncliffe construction compound (C7) would be managed under CEMP(s) for the project. In the event that contaminated groundwater is intersected the approach would be to either remove the source of the contamination by excavation and remediation of shallow impacted soils or engineering a solution to prevent the migration of contaminated groundwater into the project tunnels.	Construction
Unsustainable release of groundwater resources	GW07	Treated waste water would be stored and re-used for project purposes wherever possible. Groundwater reuse would be in accordance with the policies of sustainable water use of the NSW Office of Water, such as dust suppression and earthworks	Construction

Impact	No.	Environmental management measure	Timing
Excessive inflows during construction that may exceed the design inflow criterion of 1L/sec/km	GW08	Where saturated faults and fractures are intersected additional rock support would be installed in order to ensure tunnel stability. Appropriate waterproofing measure to reduce the inflow to an acceptable quantity will be applied as required. Measures can range from a spray- on membrane to grouting or installation of a sheet membrane	Construction
Possible high groundwater inflows and sustained pressure heads (no drawdown) beneath the Cooks River and higher fracture permeability	GW09	Where higher than expected inflows are experienced as beneath the Cooks River and under other major surface water features, appropriate waterproofing measure to permanently reduce the inflow to an acceptable quantity will be applied as required. Measures can range from a spray- on membrane to grouting or installation of a sheet membrane depending on the inflow volume	Construction
Aggressive groundwater chemistry such as elevated sodium, chloride, ammonia, low pH conditions that are aggressive to concrete and steel	GW10	Building materials that are resistant to aggressive groundwater conditions would be selected.	Detailed design

Impact	No.	Environmental management measure	Timing
Spills and incidents relating to fuels, oils, lubricants and refuelling	GW11	The project works would be undertaken in accordance with a CEMP(s) for the project which would include the following management measures: • Stockpiles of fuels, hazardous liquids and chemicals would be stored in an impervious bunded area in accordance with Australian Standards and EPA guidelines • The storage of fuels and chemicals would be limited to locations more than 40 metres from any water course • **With the exception of Arncliffe construction compound, re-fuelling would occur in bunded areas or in areas beyond 40 metres from waterways. Where refuelling occurs outside bunded areas, specific refuelling procedures would be in place and operators would be trained in these procedures. Spill kits would be readily available to manage re-fuelling outside bunded areas. At Arncliffe construction compound, a bunded area would be provided where all refuelling would occur.** • Vehicles would be properly maintained to minimise the risk of fuel/oil leaks and routine inspections of construction equipment would be undertaken to identify any fuel/oil leaks • Emergency spill kits would be kept on-site and project personnel would be aware of the location of spill kits and trained in their use • Hazardous materials handling procedures would be documented and implemented • In the event of an incident resulting in impacts to human health or the environment, works would cease immediately and the EPA would be notified (if required) • Erosion and sediment control measures would be regularly inspected, and particularly following rainfall events. The controls would remain in place until construction works are completed and areas are stabilised.	Construction
Groundwater inflow into tunnels exceeding project requirements	GW12	A tunnelling procedure that details a methodology to determine when and what type of waterproofing is required to be installed during construction would be implemented during construction. Pre-excavation pressure grouting may also be used in locations identified that could produce substantial inflows to reduce groundwater inflows to an acceptable level. Post grouting (ie grouting undertaken post excavation) may also be required to further reduce groundwater inflows. Post grouting would occur within one month post excavation.	Construction
Construction of the tunnels could adversely impact surface and groundwater quality, resources and wetlands.	GW13	A groundwater monitoring program would be prepared and implemented to monitor groundwater impacts during construction. **This would include the monitoring of groundwater inflow into the tunnels.** The program would be developed in consultation with the EPA, DPI (Fisheries), NSW DPI Water and relevant councils.	Construction

Impact	No.	Environmental management measure	Timing
Cracking creek beds, localised elevated inflows to tunnels from fractured rock beneath the creeks and potential surface environmental consequences from the increased flows	GW14	Where the project alignment passes close to watercourses and inflows are elevated, appropriate waterproofing measures to permanently reduce the inflow to an acceptable quantity would be applied as required	Construction
Impact to existing registered bores.	GW15	In the event that the drawdown in a **licensed** water supply bore or irrigation bore exceeds two metres (in accordance with the Aquifer Interference Policy) **or that impacts to groundwater quality alter the beneficial use of the water,** measures would be taken to 'make good' the impact by restoring the water supply to pre-development levels. The measures taken would be dependent upon the location of the impacted bore and would be determined in consultation with the affected licence holder but could include, deepening the bore, providing a new bore or providing an alternative water supply.	Construction Operation
Ground settlement	GW16	A Settlement Monitoring Plan would be prepared that would provide details on: • Location of monitoring points • Duration of monitoring • Data collection and review • Roles and responsibilities for review of data • Triggers and actions for corrective actions.	Construction
	GW17	Building conditions surveys would be undertaken in the zone of influence of the tunnel settlement where the settlement is expected to have a potential impact. In the unlikely event that any damage occurs to a property, appropriate rectifications would be carried out.	Construction
	GW18	Services in locations where differential/ angular settlement is anticipated would be identified. A monitoring plan, triggers and actions would be agreed with the relevant utility owner prior to potential impacts occurring.	Construction
	GW19	A monitoring program, undertaken as part of the Settlement Management Plan, would be carried out prior to excavation until all relevant settlement has stabilised. Monitoring would be for a period of not less than six months after settlement has stabilised.	Construction

Impact	No.	Environmental management measure	Timing
Operation			
On-going groundwater extraction and treatment during operation	OpGW01	An OEMP would be prepared and implemented to outline management measures for groundwater inflows, treatment and discharge and protocols for spillages or incidents. Monitoring parameters may include groundwater levels, groundwater quality including field parameters, laboratory analytes and sample frequency.	Operation
Build-up of precipitated iron (slimes) and silt and sand due to slaking of the sandstone.	OpGW02	The drainage system would be regularly maintained in accordance with the Operational Environmental Management Plan.	Operation
Impact on surface and groundwater quality, resources and wetlands as a result of operation	OpGW03	A groundwater ~~quality~~ monitoring program would be prepared and implemented to monitor groundwater impacts during tunnel operations. **This would include the monitoring of groundwater inflow into the tunnels.** The program would be developed in consultation with the EPA, DPI (Fisheries), NSW DPI Water and relevant councils. **The groundwater monitoring program would continue (where appropriate) the construction groundwater monitoring program (GW13) and would continue for three years, after which, the requirement for further monitoring would be assessed. The following analytes would be added to the groundwater baseline monitoring program for the project in order to inform the discharge water quality criteria** • **Ammonium** • **Phenols** • **Organophosphorus pesticides** • **Polychlorinated biphenyls (PCBs).** **Discharge water quality criteria would be developed in consultation with the EPA.**	Operation
Failure of the leachate pumping system	OpGW04	Contingency measures to address leachate management in the event of pump failure would be explored during detailed design and implemented in the Landfill Closure Plan.	Operation
Leachate treatment plant capacity	**OpGW05**	**The final design capacity of the new leachate treatment plant would have a maximum 200 kilolitres per day and would be confirmed in consultation with Environment Protection Authority and Department of Primary Industries (Water) during detailed design.**	**Detailed design**

Impact	No.	Environmental management measure	Timing
Non-Aboriginal heritage			
Construction			
General	NAH01	Protocols would be developed for anticipated categories of unexpected non-Aboriginal heritage finds, such as tram infrastructure, late 19th to early 20th refuse, and brick works. In the event of an unexpected cultural heritage find outside of these specific protocols, the *Standard Management Procedure – Unexpected Archaeological Finds* (Roads and Maritime, 2015a) would be followed. This would include notification to the NSW Heritage Division of OEH (highly effective).	Pre-construction and construction
	NAH02	Construction personnel would be made aware of non-Aboriginal heritage sites as part of the site induction. These sites would be identified on sensitive area plans and in the CEMP (highly effective).	Pre-construction and construction
	NAH03	As part pf the construction heritage management plan, an overarching historical archaeological research design would be prepared prior to commencement of construction in consultation with the NSW Heritage Division of OEH. It would describe clear significance thresholds to possible archaeological items that may be uncovered during works and designate when monitoring, testing and / or salvage and excavation should occur in relation to the project works and timing. Post-excavation reporting, including artefact analysis and additional historical research (where necessary), would be required for any historical archaeological investigations undertaken (moderately effective).	Detailed design
	NAH04	A construction heritage management plan would be prepared prior to construction in consultation with the NSW Heritage Division of OEH**, local councils and Sydney Water**. The plan would detail how construction impacts on heritage would be minimised and managed including training and induction processes for construction personnel. Inductions are to cover built heritage, landscape and historical archaeological sites and their management, and provide heritage guidance on how to avoid / manage impacts. The induction would be prepared in consultation with a suitably qualified heritage specialist and historical archaeologist. As a minimum, the plan would include the following: • Induction protocols for staff and project personnel to undertake a cultural heritage induction, to assist them in understanding and complying with their legal obligations under the *Heritage Act 1977* • A list, plan and GIS layer showing the location of identified heritage items • A significance assessment and statement of significance for each item • Detail the mitigation measures identified and when the measures are to be implemented • Provide protocols and procedures to be enacted during construction to ensure the protection of items of heritage significance**, or elements that contribute to the values of the heritage conservation area** • An unexpected finds procedure in the event that further sites are identified during works • The separate procedure for the discovery of skeletal remains (highly effective).	Pre-construction

Impact	No.	Environmental management measure	Timing
	NAH05	Impacts to built heritage, heritage landscapes and historical archaeological sites, will to the greatest extent practicable, be avoided and minimised. Where impacts are unavoidable, works shall be undertaken in accordance with the strategy outlined in the construction heritage management plan (moderately effective).	Pre-construction and construction
Removal of heritage listed structures	NAH06	In relation to the house at 82 Campbell Street and terrace group at 28-44 Campbell Street the following would be undertaken: • The buildings would be subject to a full archival recording following the *NSW Heritage Division guidelines How to Prepare an Archival Recording* (NSW Heritage Office, 2003) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006) • Consideration should be given as to whether elements of the houses could be salvaged and used to maintain or restore other properties managed by Roads and Maritime (somewhat effective).	Detailed design
	NAH07	In relation to Rudders Bond Store, the following would be undertaken: • The bond store would be subject to a full archival recording following the *NSW Heritage Division guidelines How to Prepare an Archival Recording* (NSW Heritage Office, 2003) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006). **This would include a comparative analysis of the Rudders Bond Stores should be prepared against other laminated truss Symonds buildings in NSW and Australia** • Consideration would be given as to whether the **selected** laminated timber columns could be salvaged and re-erected and clad elsewhere within the St Peters interchange or the local area. The cladding and brick walls are not considered to be of heritage significance and are not included within the reuse proposal. **The level of fabric salvage required, the appropriate methodology for salvage and identification of appropriate adaptive reuse and locations for reuse of these elements would be determined in consultation with Heritage Council, the NSW Heritage Division of OEH and the New M5 Design Panel, with advice from a suitably qualified specialist informed by the full archival recording prior to the demolition of the item** • Investigate options for documenting the history of the Ralph Symonds company and presenting it to a national audience, in partnership with stakeholders such as the City of Sydney and Powerhouse Museum. The focus would be on their development of innovative timber construction methods during and after World War II (somewhat effective).	Detailed design / pre-construction

Impact	No.	Environmental management measure	Timing
Change of use	NAH08	In relation to the Service Garage at 316 Princes Highway, the following would be undertaken: • An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item • A photographic archival recording is undertaken prior to the current use ceasing. The archival recording should conform to the guidelines provided in *How to prepare archival records* (NSW Heritage Office, 2003) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006). The archival recording should be lodged with the relevant local libraries and the State Library of NSW. • The oral history should be prepared, which seeks to contact past and present employees as well as others with memories of the service station. The oral history should be lodged with the relevant local libraries and the State Library of NSW (somewhat effective).	Pre-construction
Potential for direct impacts due to vibration associated with surface construction	NAH09	Detailed mitigation and management measures would be developed for each heritage item directly impacted by the project with regard to vibration (surface and tunnelling) and settlement once final disturbance areas have been identified through detailed design. These mitigation and management measures would be included in the CEMP(s) for the project (highly effective).	Detailed design
Potential for direct impacts due to vibration associated with surface construction	NAH10	Surface works would adhere to safe working distances, and an existing condition survey report and program of monitoring would be undertaken to identify early potential risks at the following non-Aboriginal heritage items: • Wolli Creek Culvert • St Peters Public School, including interiors • Terrace housing, including interiors (I273) • Waugh and Josephson industrial buildings, former, showroom, offices and workshops, including interiors • Town and Country Hotel, including interiors • Group of Victorian Filigree and Victorian Italianate terrace houses – Narara, including interiors • Terrace group I12 • Water Board pump house, including Interior and substructure • Industrial Building, 'Frank G Spurway' • Former Alexandria Spinning Mills (highly effective).	

Impact	No.	Environmental management measure	Timing
Visual impacts, as well as vibration impacts to the Macdonaldtown Stormwater Channel #3	NAH11	An existing condition survey report and program of monitoring would be undertaken to identify early potential risks at the Macdonaldtown Stormwater Channel #3 (highly effective).	Pre-construction and construction
Acoustic impacts to non-Aboriginal heritage items	NAH12	The following non-Aboriginal heritage properties would be considered for at property acoustic treatment: • St Peters Public School, including interiors • Terrace group I12 (highly effective). Acoustic treatments would be confirmed during detailed design, and would consider the principles of *The Burra Charter (the Australia ICOMOS charter for places of Cultural Significance)* (ICOMOS (Australia), 2013).	Detailed design
Impacts to the Goodsell Estate Heritage Conservation Area as a result of vibration, acquisition and modification, as well as visual impacts and impacts conservation area values.	NAH13	Management measures for the Goodsell Estate Heritage Conservation Area would include: • Landscaping, to mitigate the impacts of realigning and widening roads, as well as alterations to the existing stormwater detention basin • Surface works would adhere to safe working distances • An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conversation area and within 50 metres of the main alignment tunnels (highly effective).	Pre-construction, construction and post-construction

Impact	No.	Environmental management measure	Timing
Impacts to the Clemton Park Urban Conservation Area as a result of vibration, changes in heritage area conservation values, and visual impacts.	NAH14	Management measures for the Clemton Park Urban Conservation Area would include: • Surface works would adhere to safe working distances • An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area • Landscaping would provide screening of the Bexley Road South motorway operations complex from the Clemton Park Urban Conservation Area, once established (highly effective).	Pre-construction, construction and post-construction
Impacts to the Pallamanna Parade urban Conservation Area as a result of vibration, changes in heritage area conservation values, and visual impacts.	NAH15	Management measures for the Pallamanna Parade Urban Conservation Area would include: • Surface works would adhere to safe working distances • An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area • Landscaping would provide screening of the project from the Pallamanna Parade Urban Conservation Area, once established (highly effective).	Pre-construction, construction and post-construction
Impacts to heritage values due to construction of stormwater discharge points	NAH16	The following management measures would be implemented with respect to Alexandra Canal: • Monitoring during works to ensure vibration is not impacting the Alexandra Canal walls • Preparation of an archival recording of the Canal, involving both scale drawings and photography, prior to the removal of sandstone blocks • Numbering of sandstone blocks so that those displaced by the discharge points can be replaced in their previous locations • Stockpiling displaced sandstone blocks for use in repairs of other sections of the Alexandra Canal • Installation of heritage interpretation regarding the Canal in accordance with an interpretation plan (moderately effective) • **Any rehabilitation or conservation works in the vicinity of these areas would be determined in consultation with Sydney Water, as the asset owner** • **Skilled trades people would be used for the proposed works along Alexandra Canal that involve direct interaction with the heritage item.**	Detailed design and construction

Impact	No.	Environmental management measure	Timing
Heritage interpretation	NAH17	An interpretation plan would be prepared and implemented for: • Alexandra Canal and the industrial heritage of the area. This shall include installation of a heritage interpretation regarding the Canal in accordance with an interpretation plan • The St Peters Brickpit geological site, including: – Integrate the geological interpretation into the Sydney Park brickworks in consultation with City of Sydney, as the industrial counterpart to the geological history to tell a more complete story of historical land use in the area – Integrate the geological / palaeontological discovery of the *Paraclytosaurus davdi* – Retain an exposed section of the fresh shales and siltstones, including features associated with deposition of the sedimentary rocks, and later formed fractures such as joints and faults, if **feasible and** safe to do so for both landform stability and ongoing access for interpretation (moderately effective).	Detailed design and construction
Impact to geological and palaeontological values	NAH18	An archival recording of the St Peters brickpit geological site would be undertaken prior to and during the construction (highly effective).	Pre-construction
	NAH19	An assessment and / or consultation with a palaeontologist to determine whether the project impact area has potential to contain further specimens of scientific interest (highly effective).	Pre-construction
Visual	NAH20	Approaches to appropriately manage impacts of the project to the individual contribution of views into and out from heritage properties and the long-term impact of construction would be detailed in a CEMP (highly effective). Individually tailored landscape treatments would be developed during detailed design to mitigate visual impacts at 2-34 Campbell Road, St Peters.	Pre-construction Detailed design
Impacts on archaeology	NAH21	The construction heritage management plan would include detailed procedures / strategies for the conservation and curation of any historical artefacts recovered during works (moderately effective).	Pre-construction and construction
Urban design and landscaping	NAH22	Urban design and landscaping would be undertaken to manage visual impacts to the following additional non-Aboriginal heritage items: • Terrace housing (I273) • Southern Cross Hotel (I277) • Water Board pump house (I18) (highly effective).	Construction and post-construction
Biodiversity			
Construction			
General construction impacts	B01	A Flora and Fauna Management Plan will be developed before construction **and in accordance with Roads and Maritime's *Biodiversity Guidelines* (RTA, 2011)**. The Plan will identify potential impacts to biodiversity and describe mitigation measures and environmental controls to be implemented during construction, including measures to protect biodiversity features which will be retained.	Construction
Vegetation	B02	The removal of established vegetation will be minimised, where possible.	Construction

Impact	No.	Environmental management measure	Timing
clearance	B03	Pre-clearance activities will be carried out in accordance with *Guide 1 Pre-clearing process* of Roads and Maritime's *Biodiversity Guidelines* (RTA, 2011). Pre-clearing surveys will be undertaken by a suitably qualified ecologist to identify the presence of: • Hollow-bearing trees • Threatened flora and fauna.	Construction
	B04	Trees will be removed in accordance with *Guide 4 – Clearing of Vegetation and Removal of Bushrock* of Roads and Maritime's *Biodiversity Guidelines* (RTA, 2011).	Construction
	B05	Where vegetation clearance is required, exclusion zones will be established in accordance with *Guide 2 Exclusion Zones* of Roads and Maritime's *Biodiversity Guidelines* (RTA, 2011).	Construction
	B06	Where reasonable and feasible, mature and hollow-bearing trees will be retained. Where this is not reasonable and feasible, nest boxes will be installed to mitigate the impacts of removing hollow bearing trees in accordance with Table 8.1 of *Guide 8 – Nest boxes* of Roads and Maritime's *Biodiversity Guidelines* (RTA, 2011) at least one month prior to the commencement of construction	Construction
	B07	Locally indigenous species will be included as part of landscaping and rehabilitation works to promote native fauna habitat.	Construction
Impacts to native flora and fauna	B08	Should unexpected threatened flora or fauna be located at any time during construction, relevant works will cease in the area to prevent further harm to the individual. Should this occur, a suitably qualified ecologist will be engaged to advise on appropriate mitigation and management measures.	Construction
	B09	Any fauna handling would be undertaken by an appropriately licenced ecologist in accordance with *Guide 9 – Fauna handling* of Roads and Maritime's *Biodiversity Guidelines* (RTA, 2011).	Construction
Impacts to the Green and Golden Bell Frog	B10	The Green and Golden Bell Frog Plan of Management Plan will be finalised and implemented to minimise and manage impacts to the Arncliffe key population. The Green and Golden Bell Frog Plan of Management Plan would be approved by the Commonwealth Department of the Environment and OEH, and would include: • Management measures to be implemented at the Arnciffe construction compound (C7) and RTA Ponds to minimise and manage impacts to the Green and Golden Bell Frog habitat and key population during construction. • Management measures relating to the enhancement of existing habitat at the Marsh Street Wetland • Supplementary management measures for consideration to mitigate and minimise impacts to the Green and Golden Bell Frog.	Construction
Impacts to hydrology and aquatic biodiversity	B11	Measures to mitigate potential water quality impacts during construction are outlined in Section 16.4 and Section 18.4 **of the EIS**.	Construction
	B12	Works within or near aquatic habitats and riparian areas will be managed in accordance with *Roads and Maritime's Guide 10 – Aquatic habitats and riparian zones* **and *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2012a)**.	Construction

Impact	No.	Environmental management measure	Timing
	B13	Works within aquatic habitats or riparian zones would be undertaken to limit impacts on aquatic flora and fauna, and their habitats, and impacts on riparian areas. This would be undertaken in accordance with Guide 10 of the *Biodiversity Guidelines* **and *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2012a)**.	Construction
	B14	Where possible, construction activities would minimise disturbance to waterways and riparian land.	Construction
	B15	Stockpiles would be located outside riparian corridors.	Construction
Spread of weeds	B16	Weeds within the construction footprint will be actively managed prior to the clearance of vegetation. All weed material cleared from within the construction footprint of the project will be disposed of at a facility licensed to receive green waste.	Construction
	B17	Vegetation within ~~the road reserve adjacent to~~ areas to be cleared will be managed in accordance with *Guide 6 – Weed Management and Guide 10 – Aquatic Habitats and Riparian Zones* of Roads and Maritime's *Biodiversity Guidelines* (RTA, 2011) to reduce the introduction and spread of noxious weed species.	Construction
	B18	Landscaping and revegetation works will be undertaken using weed-free topsoil in accordance with the project's urban design concept plan.	Construction
Introduction and spread of pathogens	B19	A hygiene protocol will be implemented as part of the CEMP(s) for the project to prevent the spread and exacerbation of the Chytrid Fungus in accordance with *Guide 7 – Pathogen Management* of Roads and Maritime's *Biodiversity Guidelines* (RTA, 2011).	Construction
	B20	A risk assessment process will be used for each construction compound to determine the need to clean machinery prior to entering	Construction
	B21	Pathogens will be identified as part of pre-clearing inspections. In the event that pathogens are identified within the construction footprint, appropriate mitigation measures will be identified by an ecologist and implemented as part of the CEMP(s) in accordance with *Guide 7 – Pathogen Management* of Roads and Maritime's *Biodiversity Guidelines* (RTA, 2011).	Construction
Operation			
General	OpB01	A management plan will be developed and implemented to identify and mitigate potential ongoing impacts to biodiversity, including procedures for: • Management of weeds • Management, maintenance and rehabilitation of riparian land disturbed by the project and riparian areas associated with the discharge of treated water • Maintenance of nest boxes	Operation
Greenhouse gas			
Construction			
Emission of greenhouse gases	GHG1	Prepare a Greenhouse Gas Emissions Strategy and Management Plan for the project.	Detailed design
	GHG2	Undertake an updated greenhouse gas assessment based on detailed design.	Detailed design

Impact	No.	Environmental management measure	Timing
during construction	GHG3	The emissions intensity of significant construction materials specified in the design of the project would be assessed and, where feasible and in compliance with technical specifications, low emission construction materials would be used.	Detailed design
	GHG4	Where feasible, recycled content road construction materials such as recycled aggregates in road pavement and surfacing, or similar, would be used.	Detailed design
	GHG5	The fuel efficiency of construction plant and equipment would be assessed before selection and, where feasible and reasonable, equipment with the highest fuel efficiency or equipment that uses lower greenhouse gas intensive fuel such as biofuels (eg biodiesel, ethanol) would be used.	Pre-construction and construction
	GHG6	Project planning would be undertaken to ensure that the site vehicle movements and construction activities are efficient, to avoid double handling of materials and unnecessary fuel use where possible.	Detailed design
	GHG7	Locally produced goods and services would be procured where feasible and cost effective to reduce transport fuel emissions.	Detailed design and construction
	GHG8	At least six per cent of construction energy required for the project would be sourced where possible from an accredited GreenPower energy supplier	Pre-construction and construction
	GHG9	Where possible, and fit for purpose, spoil would be beneficially re-used within the project before off-site re-use or disposal options are investigated. A spoil management strategy would be developed for the project prior to the commencement of construction and would identify spoil disposal sites and the management of excess spoil.	Pre-construction and construction
	GHG10	Waste would be diverted from landfill, including diversion of spoil, construction and demolition waste, and commercial and industrial waste, where reasonable and feasible. The management of waste would be considered as part of the preparation of the CEMP for the project, detailing the appropriate procedures for waste management.	Detailed design and construction
Operation			
Emission of greenhouse gases during operation	OpGHG 1	The main alignment tunnels would be designed to minimise fuel consumed by vehicles using the road, for example through the provision of a vertical alignment that allows consistent vehicle speeds to be maintained.	Detailed design
	OpGHG 2	A life cycle assessment would be undertaken as part of the detailed design in order to select mechanical and electrical systems with increased energy efficiencies, where reasonable and feasible, such as the tunnel ventilation system, tunnel lighting, water treatment systems and electronic toll and surveillance systems.	Detailed design
	OpGHG 3	Low carbon energy generation options would be investigated as part of the detailed design process in order to reduce the demand on mains electricity and generate renewable energy onsite, where feasible. At least six per cent of energy required for the project would be sourced from an accredited GreenPower energy supplier, where possible.	Detailed design

Impact	No.	Environmental management measure	Timing
Aboriginal heritage			
Construction			
Impacts on culturally sensitive Aboriginal sites	AH 1	Vibration generating activities, including blasting would be conducted in a manner to ensure vibration levels do not exceed three millimetres per second at potential Aboriginal heritage site SR-OVRH-1.	Construction
Indirect impacts on sandstone rock overhang site Impacts on culturally sensitive Aboriginal sites	AH 2	Vibration monitoring would be carried out during vibration intensive works within 50 metres of SR-OVRH-1. The need for vibration monitoring would be informed by a preliminary screening of activities at this location to identify what activities have the potential for vibration at this location. The preliminary screening and works requiring monitoring would be contained within the CEMP.	Pre-construction and construction
	AH 3	A baseline condition assessment would be completed by a qualified structural engineer for Aboriginal site SR-OVR-1 before construction commences, followed by a condition assessment immediately following significant vibration and with recommendations for remediation measures if required.	Pre- construction and construction
Unexpected discovery of Aboriginal objects (Project wide)	AH 4	If an Aboriginal object(s) is discovered during construction it would be managed in accordance with the *Standard Management Procedure: Unexpected Heritage Items* (Roads and Maritime Services, 2015), including: • Ceasing works in the vicinity of the object(s), where there is the potential to directly or indirectly impact on the object(s) • Notifying the construction Environmental Representative and OEH of the discovery • Engaging a qualified archaeologist to determine the nature, extent and scientific significance of the object(s) • Developing management recommendations in consultation with the qualified archaeologist, OEH and RAPs.	Construction
Unexpected discovery of Aboriginal objects (Alexandra Canal)	AH 5	In order to manage the potential discovery of an Aboriginal object(s) during pile installation adjacent to Alexandra Canal the following strategy would be implemented: • Geotechnical coring at each pile location by a geotechnical engineer to obtain intact sediment samples to a depth of around seven metres • Inspection of obtained sediment samples by a qualified archaeologist in consultation with the geotechnical engineer in order to characterise the soil profile and identify any Aboriginal archaeological materials Should Aboriginal archaeological material be present within one or more core samples, management would occur in accordance with the *Standard Management Procedure: Unexpected Heritage Items* (Roads and Maritime, 2015).	

Impact	No.	Environmental management measure	Timing
Unexpected discovery of human remains	AH 6	If human remains are discovered during construction would be managed in accordance with the *Standard Management Procedure: Unexpected Heritage Items* (Roads and Maritime Services, 2015), including: • Ceasing works in the vicinity of the remains, with the potential to directly or indirectly impact on the remains • Notifying the construction Environmental Representative, OEH and NSW Police of the discovery • Following directions from the NSW Police and / or OEH, as relevant, depending on the nature of the remains and the outcomes of forensic investigations.	Construction
Resource use and waste minimisation			
Construction			
Resource consumption	WM01	Construction energy consumption would be reduced through initiatives such as: • Use of roadheaders, which can excavate a more efficient shape for the road tunnel than tunnel boring machines, resulting in less spoil generation and less energy consumption for handling, management and transport of spoil • Local materials procurement where feasible and cost effective to reduce fuel consumption for transport • Selection of efficient construction plant and equipment where possible • Use of recycled materials where feasible • Efficient practices on site (for example, switching off engines when not in use) • Use of energy efficient or solar powered lighting for temporary construction facilities • Investigating the use of biofuel for construction vehicles.	Construction
	WM02	Where feasible and reasonable, construction material would be sourced from within the Sydney region.	Pre-construction and construction
	WM03	Unnecessary resource consumption would be avoided by making realistic predictions of the required quantities of resources such as construction materials	Construction
	WM04	Resource recovery would be applied to the management of construction waste and would include: • Recovery of resources for reuse-reusable materials generated by the project would be segregated for reuse either on-site or off-site where possible, including the reuse of the major waste streams (VENM and ENM) • Recovery of resources for recycling - recyclable resources (such as metals, plastics and other recyclable materials) generated during construction and demolition • Resources would be segregated for recycling • These materials would then be sent to an appropriate recycling facility for processing. • Recovery of resources for reprocessing -cleared vegetation would be mulched or chipped on-site and used for landscaping, in the absence of a higher beneficial use being identified.	Construction

Impact	No.	Environmental management measure	Timing
	WM05	Where reasonable and feasible, Packaging Take Back arrangements would be implemented with suppliers.	Construction
Management of waste	WM06	Wastes would be managed (classified, handled and stored) and reused / recycled / disposed of in accordance with relevant State legislation and government policies including the POEO Act*, Waste Avoidance and Resource Recovery Act 2001, Waste Avoidance and Resource Recovery Strategy 2014-2021* (EPA, 2014b), and the sustainable procurement objective of the *WestConnex sustainability strategy* (WestConnex Delivery Authority, 2015).	Construction
	WM07	A Construction Waste Reuse Recycling and Energy plan (CWRREMP) would be prepared as part of the CEMP detailing appropriate procedures for waste management. The Construction Waste Recycling Reuse Environment Management Plan would ensure waste disposal and energy use is minimised by tracking and reporting performance and applying corrective action as required.	Construction
	WM08	Wastes would be managed using the waste hierarchy principles of: • Avoidance of unnecessary resource consumption to reduce the quantity of waste being generated. • Recover resources for reuse on-site or off-site for the same or similar use, without reprocessing. • Recover resources through recycling and reprocessing so that waste can be processed into a similar non-waste product and reused. • Disposal of residual waste.	Construction
	WM09	Residual waste would be disposed of to a suitably licensed landfill or waste management facility where there are no other feasible and reasonable options for waste avoidance, reuse or recycling. Waste materials requiring removal from the site would be classified, handled and stored in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste* (EPA, 2014a) until collection by a contractor for disposal.	Pre-construction and construction
	WM10	Off-site reuse of waste would comply with relevant NSW Environment Protection Authority resource recovery exemptions and requirements.	Construction
	WM11	Asbestos handling and management would be undertaken in accordance with the project's Asbestos Management Plan and relevant legislation, policies and standards: • *Work Health and Safety Act 2011* • *Code of Practice for the Safe Removal of Asbestos 2nd Edition (NOHSC, 2005a).* • *Code of Practice for the Management and Control of Asbestos in Workplaces (NOHSC, 2005b).* • *Protection of the Environment Operations (Waste) Regulation 2014* – Part 7 Transportation and management of asbestos waste. • Australian Standard AS2601:1991 Demolition of Structures.	Pre-construction

Impact	No.	Environmental management measure	Timing
	WM12	Measures would be implemented to manage stockpiles such as potentially locating stockpiles outside of overland flowpaths, riparian corridors and finished and contoured so as to minimise loss of material in flood or rainfall events. Stockpiles left exposed and undisturbed for longer than 28 days would be stabilised by compaction then either sprayed with suitable tackifier, covered with anchored fabrics, or seeded with sterile grass.	
Excess spoil	WM13	A Spoil Management Strategy would be developed prior to the commencement of construction and implemented during construction. The strategy would identify spoil disposal sites and describe the management of spoil on-site and during off-site transport.	Pre-construction
	WM14	Where possible and fit for purpose, spoil would be beneficially reused within the project before off-site reuse or disposal options are pursued.	Construction
	WM15	Before being transported from construction sites, excavated spoil would be classified in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste* (EPA, 2014a) to ensure appropriate reuse or disposal.	Construction
Wastewater	WM16	Feasible and reasonable opportunities for wastewater reuse on-site or for construction purposes would be pursued (such as dust suppression both in the tunnels and for surface works).	Construction
	WM17	Wastewater not used on-site would be discharged into the local stormwater system in accordance with the requirements of an environment protection licence issued for the project.	Construction
Contaminated soil	WM18	An Unexpected Finds Protocol would be implemented in the event of encountering previously unidentified area(s) or types of contaminated material. Where this happens, all relevant work would cease in the vicinity of the discovery in accordance with a unsuitable spoil management contingency procedure which would be included as part of the Spoil Management Strategy for the project. Relevant works would not recommence until the need for and scope of remedial action(s), if required, is identified in accordance with the requirements of the *Contaminated Land Management Act 1997*.	Construction
Operation			
Management of waste	OPWM01	Wastes would be managed and disposed of in accordance with relevant State legislation and government policies including the POEO Act, *Waste Avoidance and Resource Recovery Act 2001*, *Waste Avoidance and Resource Recovery Strategy 2014-2021* (EPA, 2014b), and the sustainable procurement objective of the *WestConnex sustainability strategy* (WestConnex Delivery Authority, 2015).	Operation
Operational water requirements	OPWM02	Opportunities for reuse of wastewater would be considered in preference to discharge to the local stormwater system.	Detailed design and operation
	OPWM03	In order to reduce demand on local water supplies, options would be investigated for providing water required for operation of the deluge system from wastewater produced through the tunnel drainage system where it meets appropriate quality parameters.	Detailed design and operation

Impact	No.	Environmental management measure	Timing
Climate change and risk adaptation			
Operation			
Climate change impacts	CC01	The risk associated with future climate change on the project would be further considered during detailed design.	Pre-construction
	CC02	Implement adaptation measures to address high and extreme rated risks identified in the subsequent detailed climate change risk assessment.	Pre-construction
	CC03	Where extreme, high or medium risks have been identified in this assessment or subsequent climate change risk assessments, a review of the existing design policies, specifications or practices would be undertaken to consider the impacts of climate change.	Pre-construction
Hazard and risks			
Construction			
General	HR01	Site-specific hazard and risk management measures would be included within the CEMP, which may include items such as: • Details of the hazards and risk associated with construction activities for both surface and subsurface works • Procedures to comply with legislative and industry standard requirements • Contingency plans, as required.	Pre-construction / construction
Storage of dangerous goods and hazardous substances	HR02	Storage of dangerous goods and hazardous materials would occur in accordance with suppliers' instructions and relevant Australian Standards and may include bulk storage tanks, chemical storage cabinets / containers or impervious bunds.	Construction
	HR03	Storage, handling and use of dangerous goods and hazardous substances would be in accordance with the *Work Health and Safety Act 2011* and the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005).	Construction
	HR04	Secure, bunded areas would be provided around storage areas for oils, fuels and other hazardous liquids.	Construction
	HR05	Bunds would be provided around activities such as vehicle refuelling, servicing, maintenance or wash-down, where there is a potential for spills and contamination.	Construction
	HR06	Material Safety Data Sheets would be obtained for dangerous goods and hazardous substances stored onsite prior to their arrival.	Construction
Transportation of dangerous goods and hazardous substances	HR07	Transport of dangerous goods and hazardous substances would be conducted in accordance with relevant legislation and codes, including the Dangerous Goods (*Road and Rail Transport) Regulation 2014* and the Australian Code for the *Transport of Dangerous Goods by Road and Rail* (National Transport Commission, 2008).	Construction

Impact	No.	Environmental management measure	Timing
Aviation Measures	HR08	The project would be constructed in line with Civil Aviation Safety Authority requirements, to the satisfaction of the Secretary of the Commonwealth Department of Infrastructure and Regional Development.	Construction
Aviation Measures - lighting	HR09	The project would be constructed in in accordance with the requirements of the Civil Aviation Safety Authority and the *Sydney Airport Master Plan 2033*, with respect to lighting used during construction.	Construction
Operation			
Fire and life safety	OpHR01	The fire and safety systems and measures adopted for the project would be equivalent to or exceed the fire safety measures recommended by NFPA502 (American), PIARC (European), AS4825 (Australian) and Roads and Maritime standards.	Detailed Design
Storage of dangerous goods and hazardous substances	OpHR02	Storage of dangerous goods and hazardous materials would occur in accordance with supplier's instructions and relevant Australian standards and may include bulk storage tanks, chemical storage cabinets / containers or impervious bunds.	Operation
	OpHR03	Storage, handling and use of dangerous goods and hazardous substances would be in accordance with the *Work Health and Safety Act 2011* and the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005).	Operation
	OpHR04	Secure, bunded areas would be provided around storage areas for oils, fuels and other hazardous liquids. Impervious bunds would be of sufficient capacity to contain at least 110 per cent of the volume of the largest stored container.	Operation
	OpHR05	Bunds would be provided around activities such as vehicle refuelling, servicing, maintenance or wash-down, where there is a potential for spills and contamination.	Operation
	OpHR06	Material Safety Data Sheets would be obtained for dangerous goods and hazardous substances stored onsite prior to their arrival.	Operation
Transportation of dangerous goods and hazardous substances	OpHR07	The transport of dangerous goods and hazardous substances would be prohibited through the main alignment tunnels and on and off-ramp tunnels.	Operation
Incident response	OpHR08	An Incident Response Plan would be developed and implemented in the event of an accident or incident.	Operation
	OpHR09	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.	Operation
Electric and magnetic fields	OpHR10	The detailed design of the project substations would ensure that the exposure limits for the general public suggested by the Draft Radiation Standard (*Australian Radiation Protection and Nuclear Safety Agency*, *2006*) would not be exceeded at the boundary of the substation sites.	Detailed Design

Impact	No.	Environmental management measure	Timing
Aviation Measures	OpHR11	The project would be operated in line with Civil Aviation Safety Authority requirements, to the satisfaction of the Secretary of the Commonwealth Department of Infrastructure and Regional Development.	Detailed Design
Aviation Measures - lighting	OpHR12	Aviation hazard lighting, building lighting and surface road lighting would be designed and operated in accordance with the requirements of the Civil Aviation Safety Authority and the *Sydney Airport Master Plan 2033*.	Detailed Design and Operation
Cumulative impacts			
Cumulative impacts	CI01	Consultation would be undertaken with local communities potentially affected by the impacts of multiple projects in addition to the project.	Construction
	CI02	Where relevant, consultation would be undertaken with proponents of other nearby developments to increase the overall awareness of project timeframes and impacts.	Construction

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9 Conclusion and next steps

The Department of Planning and Environment (DP&E) will, on behalf of the NSW Minister for Planning, review the environmental impact statement and this submissions and preferred infrastructure report. Once DP&E has completed its assessment, a draft assessment report will be prepared for the Secretary of DP&E, which may include recommended conditions of approval.

The assessment report will then be provided to the NSW Minister for Planning, who will determine the project.

A copy of the submissions and preferred infrastructure report will be published on DP&E's website. The NSW Minister for Planning's determination including any conditions of approval and the Secretary's report will be published on DP&E's website immediately following determination.

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10 References

ACTAQ, 2014, *Initial Report on Tunnel Air Quality.* Advisory Committee on Tunnel Air Quality.

AECOM, 2015, *WestConnex New M5 State significant infrastructure application report*.

AECOM, 2015, *WestConnex Stage 2: M5 Geotechnical Investigation – Report of Completed Work.*

AECOM 2016, *Traffic and Transport assessment of design changes*. Prepared for Roads and Maritime.

AECOM 2016, *Noise and Vibration assessment of design changes*. Prepared for Roads and Maritime.

AECOM 2016, *Surface water and flooding assessment of design changes*. Prepared for Roads and Maritime.

ANZECC (Australian and New Zealand Environmental Conservation Council), 1990, *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration.*

ANZECC (Australian and New Zealand Environment Council), 1990, *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration.*

Australian Green Infrastructure Council, 2011, *AGIC Guideline for Climate Change Adaptation,* Revision 2.1.

Austroads, 2015, *Guide to Road Design.*

Bureau of Transport Statistics, 2014, *September 2014 Release Employment Forecasts*.

CDM Smith, 2015, *West Connex Stage 2 New M5 Groundwater Modelling Report*. Prepared for AECOM.

Chapman GA and Murphy CL, 1989, *Soil Landscapes of the Sydney 1:100,000 Sheet report,* Department of Conservation and Land Management, Sydney.

City of Botany Bay Council, 2012, *Mascot Town Centre Precinct Masterplan*.

City of Sydney, 2012, *Sydney Local Environmental Plan 2012*, NSW Government.

Committee for Sydney, 2015, *Big City Analytics: Identifying Sydney's economic, employment and population Centres of Gravity.*

Department of Environment and Conservation (DEC), 2005, *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*.

DEC, 2006, *Contaminated Site: Guidelines for the Site Auditor Scheme (2nd Edition)*, New South Wales Department of Environment and Conservation.

Department of Environment, Climate Change (DECC), 2007, *Floodplain risk management guideline – practical considerations of climate change.*

DECC, 2009, *Interim Construction Noise Guidelines*, DECC, Sydney.

DECC, 2009, NSW 2009 *Waste Classification Guidelines.*

Department of Environment, Climate Change and Water (DECCW), 2006, *NSW Water Quality and River Flow Objectives*. NSW Office of Environment and Heritage.

DECCW, 2009, *Draft National Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus*. Prepared by Dr Peggy Eby.

DECCW, 2011, *NSW Road Noise Policy.*

Department of the Environment (DoE), 2015, *National Climate Resilience and Adaptation Strategy,* Australian Government.

Department of Foreign Affairs and Trade (DFAT), 2016, *Climate Change*.

Department of Infrastructure, Planning and Natural Resources (DIPNR), 2005, *NSW Floodplain development manual*.

Department of Premier and Cabinet, 2011, *NSW 2021: A plan to make NSW number one*.

Department of Primary Industries (DPI), 2012, *NSW Aquifer Interference Policy*, DPI, Sydney.

Department of Urban Affairs and Planning (DUAP), 2001, *Crime Prevention and the Assessment of Development Applications.*

Eco Logical Australia 2016a, *Habitat Creation and Captive Breeding Plan: Green and Golden Bell Frog at Arncliffe*. Prepared for WCX AT Pty Ltd.

Eco Logical Australia 2016b*, Construction of Green and Golden Bell Frog habitat ponds, Marsh Street, Arncliffe – Flora and Fauna Assessment*. Prepared for AECOM Australia Pty Ltd.

Environmental Protection Authority (EPA), 1995, *Contaminated Sites, Sampling Design Guidelines*.

EPA, 2006, *Contaminated Sites, Guidelines for the Site Auditor Scheme* (2nd Edition).

EPA, 2014a, *Waste Classification Guidelines, Part 1: Classifying Waste*.

EPA, 2014b, *NSW Waste Avoidance and Resource Recovery Strategy 2014-21.*

EPA, 2015, *Draft Environmental Guidelines Solid Waste Landfills*.

Equatica, 2014, *City of Rockdale Water Quality Monitoring Study - Part A: Report*, Prepared for Rockdale City Council.

German Institute for Standardization, 1999, *Structural Vibration – Effects of Vibration on Structures,* DIN 4150-3 (1999-02).

Hayden D, 2004, *A Field Guide to Sprawl, New York*: W. W. Norton and Company.

ICOMOS (Australia), 2013, *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance*. Burwood, Victoria, Australia ICOMOS.

Infrastructure NSW, 2012, *State Infrastructure Strategy 2012-2032.*

Infrastructure NSW, 2014, *State Infrastructure Strategy Update 2014.*

KPMG, 2015, *WestConnex Full Scheme: Economic Appraisal – Report prepared for the WestConnex Delivery Authority.*

Ku-ring-Gai Council, 2013. *Ku-ring-gai Flying-fox Reserve Management Plan, 2013.*

Landcom, 2004, *Managing Urban Stormwater – Soils and* Construction, Volume 1, Blue Book 1, NSW Government, Sydney.

Longley I, 2014, *TP11: Criteria for In-Tunnel and Ambient Air Quality*, NSW Advisory Committee on Tunnel Air Quality.

Marrickville Council, 2011, *Marrickville Local Environmental Plan 2011*, NSW Government.

Marrickville Council, 2014. *Camdenville Park Draft Plan of Management.*

MWH and PB Joint Venture, 2009, *Cooks River Flood Study*, prepared for the Sydney Water Corporation.

National Environment Protection Council (NEPC), 1998, *National Environment Protection (Ambient Air Quality) Measure - Revised Impact Statement*, National Environment Protection Council.

(NEPC), 2003, *National Environment Protection (Ambient Air Quality) Measure*.

National Health and Medical Research Council (NHMRC), 2008, *Air Quality in and Around Traffic Tunnels, Systematic Literature Review*, National Health and Medical Research Council.

NHMRC, 2008, *Air Quality in and Around Traffic Tunnels, Systematic Literature Review*.

National Occupational Health and Safety Commission (NOHSC), 2005a, *Code of Practice for the Safe Removal of Asbestos* (2nd Edition).

NOHSC, 2005b, *Code of Practice for the Management and Control of Asbestos in Workplaces.*

NSW Government, 2014. *A Plan for Growing Sydney.*

NSW Government, 2015, *WestConnex Updated Strategic Business Case.*

NSW Heritage Office, 2003, *How to Prepare Archival Records of Heritage Items.*

NSW Heritage Office, 2006, *Photographic Recording of Heritage Items Using Film or Digital Capture.*

NSW Office of Water, 2011, *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources.*

NSW Office of Water, 2012, *Guidelines for Controlled Activities on Waterfront Land.*

Office of Environment and Heritage, NSW (OEH), 2011, *Guidelines for Consultants Reporting on Contaminated Sites.*

OEH, 2013, *The Native Vegetation of the Sydney Metropolitan Area, Volume 2: Vegetation* Community Profiles Version 2.0.

OEH, 2014, *NSW Government Resource Efficiency Policy.*

OEH, 2014, *Framework for Biodiversity Assessment*.

OEH, 2014, *NSW Biodiversity Offsets Policy for Major Projects.*

OEH, 2015, *Vegetation Information System: Classification.*

OEH eSPADE tool www.environment.nsw.gov.au/eSpadeWebapp, accessed 17/2/2016.

Permanent International Association of Road Congress (PIARC), 2012, *Road tunnels: Vehicle emissions and air demand for ventilation*.

Roads and Maritime Services (RMS), 2013. *Environmental Impact Assessment Practice Note – Guidelines for Landscape Character and Visual Impact Assessment.*

RMS, 2014, *Advisory Committee on Tunnel Air Quality TP04: Road Tunnel Ventilation Systems*.

RMS, 2014, *Land Acquisition Information Guide*.

RMS, 2014, *Beyond the Pavement: Urban design policy, procedures and design principles*. *Guidelines for Risk Management.*

RMS, 2015, T*echnical Guide: Climate Change Adaptation for the State Road Network (Draft)*.

RMS, 2015, *Standard Management Procedure: Unexpected Heritage Items,* Roads and Maritime Services.

RMS, 2016, *Heritage and Conservation Register,* www.rms.nsw.gov.au/about/environment/protecting-heritage/heritage-conserv-reg/index.html.

Roads and Traffic Authority (RTA), 2005, *Accident Reduction Guide Part 2: Road Safety Audit*. roadsafety.transport.nsw.gov.au/downloads/audit-practices.pdf.

RTA, 2006, *Noise wall design guideline: Design guidelines to improve the appearance of noise walls in NSW*.

RTA, 2008, *Designing to Minimise Vandalism (Final Draft)*.

RTA, 2009, *M5 Transport Corridor Study – Preliminary Overview Report.*

RTA, 2010, *Roads and Maritime Traffic Control at Worksites.*

RTA, 2011, *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects.*

RTA, 2011, *Guide 1 Pre-clearing process of the Biodiversity Guidelines.*

SGS Economics and Planning, 2016, *WestConnex Stage 2 EIS – Review of Strategic Alternatives and Socioeconomic Impacts Final Report.*

Soil Conservation Service of New South Wales (SCS NSW) 1995. *Botany Bay 1:25,000 Acid Sulfate Soil Risk Map.*

Standards for Highways, 1997, *UK Design Manual for Roads and Bridges*.

Sydney Airport Corporation Limited, 2014, *Sydney Airport Master Plan 2033.*

Sydney Metropolitan Catchment Management Authority (SMCMA), 2011, *Botany Bay & Catchment Water Quality Improvement Plan*.

Sydney Motorways Project Office (SMPO), 2013, *WestConnex Business Case Executive Summary*, SMPO, Sydney.

SMPO, 2013, *WestConnex Strategic Environmental Review*, SMPO, Sydney.

SMPO, 2015, Updated *WestConnex Strategic Environmental Review*, SMPO, Sydney.

SMPO, 2015, *Draft WestConnex Urban Design Framework,* SMPO, Sydney.

Transport for NSW, 2012, *NSW Long Term Transport Master Plan.*

Transport for NSW, 2012, *Sydney's Rail Future: Modernising Sydney's Trains*.

Transport for NSW, 2013, *Sydney's Bus Future: Simpler, faster, better bus services*.

Transport for NSW, 2013, *Sydney's Cycling Future: Cycling for everyday transport*.

Transport for NSW, 2013, *Sydney Walking Future: Connecting people and places*.

Transport for NSW, 2013, *Sydney City Centre Access Strategy*.

Transport for NSW, 2013, *NSW Freight and Ports Strategy*.

Transport for NSW, 2013, *Transport Environment and Sustainability Policy Framework*.

Transport for NSW, 2013, *Transport Environment and Sustainability Policy Statement*.

Transport for NSW, 2015, Sydney CBD to Parramatta – Strategic Transport Plan.

TTM Consulting, 2016. *WestConnex Stage 2 EIS Review of Traffic, Transport, and Modelling* [for City of Sydney, City of Botany Bay and Marrickville Councils].

UrbanGrowth NSW, 2015, *Draft Parramatta Road Urban Transformation Strategy.*

UrbanGrowth NSW, 2015, *Transformation Plan: The Bays Precinct, Sydney.*

WDA, 2015, *WestConnex Sustainability Strategy Summary,* WestConnex Delivery Authority.

Western Sydney Airport Alliance, 2013, *Building Badgerys: The next steps towards a Western Sydney Airport*.

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